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Monthly Message

The year 1960 marks the 100th anniversary of the establishment of the Army Signal Corps. On behalf of the medical profession and more particularly the Medical Corps of the United States Army, I am happy to congratulate the Signal Corps on this anniversary.

Surgeon General Lovell in 1819 instituted the recording of weather observations by medical officers at all posts. Later, measurements of rainfall and in 1843 wind direction and notes as to sunshine, rain and snow were added. In 1844 Surgeon General Lawson prepared tables of mean temperature from these diaries, and the meteorologist of the War Department, James P. Espy, worked in the Surgeon General's office; in 1845 he published "Philosophy of Storms." Maps were prepared and he further stated, "By an examination of these maps we are now able to learn the shape and size of storms, and direction velocity of their motion, as they pass over the United States."

The Signal Corps originated from the hobby of a medical officer, Assistant Surgeon Albert J. Myer, for whom Fort Myer is named. He entered the Army in 1854 and became interested in mechanical and manual signaling and later in telegraphic communications in the armies. He organized signaling in the Army and in June 1860 was commissioned Major and Signal Officer. He was promoted to Colonel and Chief Signal Officer in 1866 and Brigadier General in 1880. I am sure the entire medical profession has noted with great pride the development of this fine Corps and its extraordinarily effective work in communications over the succeeding years.

And incidentally, the Medical Corps of the three services can take added pride in the lusty grandson, sired in turn by the Signal Corps, now the United States Air Force!

Frank B. Berry

FRANK B. BERRY, M.D.
Assistant Secretary of Defense
(Health and Medical)

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Foreword

The *United States Armed Forces Medical Journal* is a monthly publication of professional and administrative information for medical personnel of the Department of Defense. The Assistant Secretary of Defense (Health and Medical) and the Surgeons General of the United States Army, Navy, and Air Force invite members of the regular and reserve medical services, the professional consultants of the military departments, and other physicians and health scientists with an interest in Department of Defense activities to submit manuscripts for publication in this *Journal.*

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UNITED STATES
Armed Forces Medical Journal

Medical and Public Health Aspects of Nuclear Weapons Incidents in Peacetime

BRIGADIER GENERAL THEODORE C. BEDWELL, JR., USAF, MC
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IN FEBRUARY 1957, an Atomic Energy Commission–Department of Defense agreement placed the responsibility for jurisdiction—in the event of an accident or incident involving nuclear weapons—on the agency (i. e., AEC or DOD) having physical possession of the weapon. Supplementary Air Force directives require that the nearest base respond to the situation, until appropriate representatives of the Command concerned arrive on the scene. Procedures for cooperation among the AEC, DOD agencies, and the U.S. Public Health Service have been established. A radiologic assistance plan, now being prepared, will outline procedures whereby state and local agencies may also obtain assistance.[1]

Considerable attention has been given to the problem by SAC Headquarters personnel. Maintenance of a true global war deterrent capability requires that aircraft and weapons be kept in combat-ready condition. Coping with accidents that result from this situation has become an increasingly important problem. Comprehensive plans and directives for required actions when such incidents occur have been developed and are continually being evolved.[2,3]

A few incidents involving nuclear weapons have been reported in

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From Headquarters, Strategic Air Command, Offutt Air Force Base, Neb. Based on "Peacetime Nuclear Weapons Accidents," a handbook prepared by Colonel Meyer and the staff of Headquarters SAC Disaster Control Team, October 1958; SAC TP 160–4, "Guide to Medical Planning for Disasters"; and operational experiences of headquarters and subordinate disaster control teams in coping with actual weapons accident situations.

the public press in the past few years. The scope of the problems involved in nuclear weapons incidents, over-all plans and policies for coping with these incidents, and suggested procedures that may be useful to military organizations and adjacent civilian community groups are discussed in this report.

TYPES OF INCIDENTS

A nuclear incident is defined in the Code of Federal Regulations, part 140.3 of title 10, as any occurrence within the United States or its possessions causing bodily injury, sickness, disease, or death, loss of, or damage to property, or loss of use of property, and arising out of or resulting from radioactive, toxic, explosive, or other hazardous properties of source materials, special nuclear material, or byproducts. The joint AEC-DOD agreement, mentioned previously, gives the agency having physical possession of weapons complete jurisdiction over the incident, although assistance from other agencies may be requested.

Non-weapons accidents or incidents may also occur, involving radioactive materials that are not associated with weapons. Although this report deals principally with weapons incidents, disaster control personnel must be prepared to deal with other types of nuclear incidents. Much of the following information may be applicable to either type of incident with suitable modification.

The types of weapons accidents that might occur include: (1) fire or high explosive detonation, or both, with virtually no effect on nuclear components; (2) fire or high explosive component detonation, or both, with burning or dissipation of weapons components such as plutonium or uranium; (3) exposure of personnel to toxic thermal decomposition products or chemicals associated with the weapons, resulting from either of the first 2 types of accidents; and (4) a very low-yield nuclear explosion. The last possibility, because of the nature of weapons design, is considered to be a negligible hazard. The principal hazard would result from detonation of high explosive weapons components rather than from fission.

Distribution of weapons and weapons components involves the use of motor trucks, trains, aircraft, and possibly ships or other vessels. If the vehicle carrying the weapons becomes involved in an accident, the weapon may be affected. However, other catastrophes associated with such an accident may present a hazard equal to or greater than that from the weapon or weapons. For example, major airplane crashes present the possibility of explosion of unburned fuel aboard

the aircraft. In such a case, ordinary accident measures need only additional specialized support to provide for nuclear hazards.

A variety of interrelated problems arise as a result of a nuclear weapons incident. The first consideration, naturally, is saving life and minimizing injury to personnel involved in the incident itself. If the weapon is not directly involved, measures must be taken to prevent damage to it or to preclude its becoming a hazard, through either high explosive detonation or contamination. If off-base property of civilians or on-base property of military or civilian personnel has been involved, the question of possible claims for damages exists. Apprehension and concern among both base and civilian personnel may create a serious problem of press and public relations. Therefore, response to an incident involves medical, legal, explosive ordnance disposal, engineering, security, and operational personnel, all of whom must be properly trained, adequately equipped, and operating as a team under competent direction. In the Strategic Air Command, teams have been established at Headquarters SAC, the headquarters of the numbered Air Forces, and bases throughout the Command. Similar teams exist at numerous Defense Atomic Support Agency, Atomic Energy Commission, and U.S. army and naval bases.

HAZARDS OF NUCLEAR WEAPONS INCIDENTS

Nuclear weapons used by this country are designed so that there is little likelihood of an accident or incident resulting in a nuclear explosion. Careful studies by design agencies and the USAF Nuclear Systems Safety Group assure that maximum precautions against even a low-yield nuclear detonation are incorporated into nuclear devices used by the U.S. Armed Services. However, even the remote possibility of a small, low-order nuclear explosion should not be entirely discounted, and beta-gamma monitoring for the possible presence of fission products is necessary. Such monitoring will also detect certain weapons components that normally emit a small amount of gamma radiation.

Associated with nuclear weapons are varying quantities of high explosives, which may detonate in the usual manner. Blast and thermal effects associated with such a detonation may produce casualties. Blast effects may be both direct and secondary, the latter resulting from missiles produced by the destruction or deterioration of structures, the carrying vehicle, or other material. Thermal radiation may cause flash burns. Burning fuel from aircraft or carrying vehicle, or fires resulting from weapons detonation may inflict sec-

ondary flame burns. High energy gamma radiation and neutrons, as well as beta-gamma radiation from residual fission products, could occur in a true nuclear explosion, but these effects would normally not be associated with the high explosive detonation of the type of weapons now in use.

On the other hand, in a nuclear weapons accident or incident in which there is no nuclear yield, the adjacent areas may be contaminated by unfissioned nuclear material. These plutonium and uranium components may burn, fume, or be broken up. Depending on the nature of the incident, varying problems of contamination are created, particularly with alpha-emitting radioactive materials.

The effects of blast on personnel and structures have been described in some detail.[4] One of the principal differences between a nuclear blast wave and that resulting from high explosives associated with a weapon is that the duration of the positive phase from a nuclear blast wave is considerably longer than that from high explosives.

Pressures of between 10 and 15 pounds per square inch have been reported as rupturing ear drums. Overpressures of 200 to 300 pounds per square inch from conventional explosions may cause death from the direct effects of the blast. Pressures of 80 pounds per square inch are assumed to produce injury on certain body surfaces. On the other hand, an overpressure of only 5 pounds per square inch may result in serious damage to many types of buildings, producing numerous missile fragments that can cause injury to personnel. Another source of blast effects is the pressure wave, which may throw persons against solid objects or toss them about. In this respect, individuals lying in a prone position would be more protected than those standing erect.

Studies on the potential hazards of high explosive blast fragmentation indicate that with current weapons, the radius in which personnel may be seriously injured from blast or fragmentation ranges from 400 to 1000 feet. A minimum safe distance of 1500 feet is recommended for nonessential personnel not actually working with the accident situation, providing a margin of protection against secondary missiles carried with sufficient velocity to produce minor injuries beyond the 1000 foot range.

The hazard potential of flame burns and other thermal radiation injuries associated with aircraft and weapon or missile weapon incidents will be increased when large quantities of fuel or propellant are present in addition to the high explosive components. Temperatures in accident situations may range from 1100° F to as high as 3600° F in the flame and hot gases, and considerable heat will be transferred by radiation to persons and objects in the area. The ratio of the

distance from the fire to the diameter of burning is a controlling feature as far as this hazard is concerned.[5] Other hazards from the fires connected with these accidents include contact with hot or burning solid or liquid material, falling cinders, or other debris.

Withdrawal beyond the 1500 foot radius recommended for protection against high explosive blast will amply protect personnel against thermal radiation effects from burning materials in the absence of nuclear yield thermal radiation and, in most cases, will also protect against falling, burning materials. Thermal reflective suits and other protective equipment furnished to fire fighters, if properly utilized, provide adequate protection against thermal radiation. Other disaster control personnel, such as medical, explosive ordnance disposal, and security forces, should exercise caution in discharging their duties while fires are still in progress.

Flame and smoke from burning high explosives may vary from bright red to yellow to greenish white, or combinations of no predominant color. Some explosives give off a white smoke and others burn with virtually no smoke. Smoke and fumes from burning high explosives may also contain toxic materials.

The explosives contained in, or accompanying, some weapons present hazards in addition to those of direct detonation. Explosives involved in an accident may become shock or impact sensitive, and may detonate if even slightly disturbed. Some explosives may melt and flow without burning, then resolidify, leaving a yellow, orange, or buff-colored residue, which occasionally turns rust red from extensive heat. These residues, together with unmixed high explosive components, may detonate upon shock or impact. Similarly, the detonators also may continue to be shock sensitive. Occasionally, residue from burned high explosive will appear as a flaky, white material, highly toxic if ingested. Intact blocks of high explosive may cause dermatitis. Because of these hazards, explosives or explosive residue should be handled only by specially trained explosive ordnance disposal personnel.[6]

Fumes and gases from burning high explosives can be extremely poisonous, and inhalation may produce serious lung or systemic effects. Fire fighters supplied with air respiratory equipment will be amply protected against these fumes. However, other personnel working downwind, or in the smoke of a fire in which high explosives are involved, may be seriously affected unless equipped with air respirators or the all-purpose chemical cartridge respirator. Great care should be exercised in the use of such devices; and normally, monitoring, salvage, and similar recovery operations, other than rescue operations, should not be attempted while the fire is in progress.

IONIZING RADIATION—PROBLEMS AND EXPOSURE EFFECTS

In military operations involving exposure of personnel to penetrating ionizing radiation, the "air dose" is generally accepted as an indication of radiation hazard, and is a means for predicting effects of such exposures. Air dose is usually defined as the dose in roentgens computed from measurements made with standard Department of Defense radiation survey instruments of the ion chamber or Geiger-Müller type (AN/PDR–39, AN/PDR–27, and similar devices), or as indicated on standard Defense Department dosimeters (such as the DT–60). A number of technical inaccuracies result from adoption of such procedures. However, in beta-gamma exposure from mixed fission products such as exist in a fallout field following a nuclear explosion if the fireball touches the earth, this method is sufficiently accurate for field and general use and eliminates the need for more sophisticated dosimetry in a war or emergency situation.

In dealing with problems of exposure to various isotopes or mixtures of radioactive materials with a complex spectrum of neutrons and gamma rays or beta particles, a true estimation of the external radiation hazard and maintenance of proper health physics records requires computation of the dose in rem, taking into account the relative biologic effectiveness of the energies involved. Possible internal exposure to alpha and beta emitters also requires more precise dosage computation.

In general, exposure to an air dose of 200 roentgens within 48 hours or less will produce nausea and vomiting in up to 50 percent of exposed personnel within a few hours after completion of such an exposure period.[7] An accidental or emergency dose of 25 rem, or in the case of external hazard an air dose of 25 r, occurring only once in a lifetime, need not be included in computing the radiation exposure status of such an individual.[8] Although the effects cannot be stated precisely, spreading a dose over a longer period of time reduces the biologic and physiologic response to the dose. Various studies on the responses to radiation doses have been made, and tables and monograms have been developed to indicate the results of these studies.[9,10] Table 1 summarizes the expected effects from exposure to various radiation doses occurring within 24 hours or less, and is patterned on the information compiled by Gerstner.[7] These criteria are applicable to the emergency situation, and in no way should be interpreted as minimizing the strict need for complying with prescribed permissible exposure limitations in routine industrial situations. It should be recognized that there is considerable variation in the actual individual response to a given radiation dose. Biologic

variations, age and state of health, shielding, and body orientation with the source or sources affect the resulting reaction to the exposure. Attention is invited also to Table 11.57, page 471, The Effects of Nuclear Weapons.[4]

Whole body external radiation responses do not give a reliable guide to expected effects from radioactive material taken into the body, and should not be directly utilized in predicting internal radiation dose

Table 1. ***Summary of over-all effects of exposure to whole body air doses****

Dose range (r)	*Effects*
0–50	Subthreshold. No problem from a medical viewpoint in emergency situations. (Under peacetime conditions an accidental or emergency dose of 25 rem whole body occurring only once in a lifetime is assumed to have no effects on the radiation tolerance status of personnel receiving it.)
51–100	Trivial and transitory clinical changes, posing no medical problem. (Additional radiation should be restricted as much as possible since a lowering of radiation tolerance may occur. Symptoms, if any, should be treated only as they arise.)
101–150	Trivial and transitory changes similar to those described above.
151–200	Acute radiation effects begin to be noticeable and may be of clinical importance in a few radiosensitive persons. Beyond 200 roentgens an appreciable number of persons will be expected to develop significant immediate effects and delayed effects. It is emphasized that the onset of more serious symptoms is delayed for several days or weeks.
201–400	Radiation syndrome serious to grave in effect. Measures instigated properly can give a favorable outlook with more than likely recovery.
401–600	Acute radiation syndrome with predominantly grave course.

*Based on information compiled by Gerstner.[7]
trivial: deviations from normal so subtle as to be inconsequential or nondetectable
light: mild signs and symptoms requiring neither medical attention nor treatment
moderate: well-developed radiation symptoms manageable by ambulation
serious: conditions in which hospitalization is necessary, with a good chance for recovery
grave: poor chances for recovery
lethal: no chance for recovery

response. Permissible levels from internal emitters have been developed that, as far as possible, are consistent with over-all criteria established by the National Committee on Radiation Protection and Measurements (NCRP). For occupational exposures the maximum permissible dose for external radiation to critical organs accumulated at any age is not to exceed 5 rem multiplied by the number of years over age 18. The dose in any 13 consecutive weeks should not exceed 3 rem. The problem of assessing internal radiation dose effects is complicated, since internal absorption of radioactive materials produces varying effects depending on the critical organ in which the material is deposited, the effective half-life of the material, the type and energy of the radiation, and distribution of the deposited material throughout the body. Although no official limits have been selected for single internal exposure to radioactive materials, the dose in rem to a critical organ from a single exposure can be calculated.[11] Some calculations of this type have been published.[12]

Under war or acute emergency conditions involving nuclear explosions, or widespread dissipation of fission products due to accidental destruction of a nuclear reactor, the internal radiation exposure problem in the initial hours is far outweighed by the whole body external gamma radiation hazard. If protective measures are taken against whole body gamma radiation, there will be no immediate problem with regard to internal radiation through inhalation or ingestion of fission products. During the recovery period, foodstuffs contaminated with fission products should not be used unless contamination levels are lower than those permissible in an emergency. Plutonium and uranium, which emit alpha particles, may be internal health hazards if encountered in aerosol or suspended states. If these materials are present, protective measures must be taken. Accumulated whole body external air doses that might be expected in the presence of fission products following an accident or incident are shown in figure 1.

A major radioactive problem, which may be present in many peacetime nuclear weapons incidents, is dissemination of plutonium or uranium throughout the incident area as a result of fire, high explosive detonation, or other means. As previously mentioned, both plutonium and uranium may be ignited and burned, or they may fume. Both smoke and fumes will contain alpha emitters, which will be deposited on nearby surfaces and on the ground. Experimental studies suggest that ground contamination by 1000 micrograms of plutonium per square meter should be safe for long-term occupancy (table 2). The hazard from plutonium far outweighs that from uranium, and protective measures against plutonium will provide sufficient

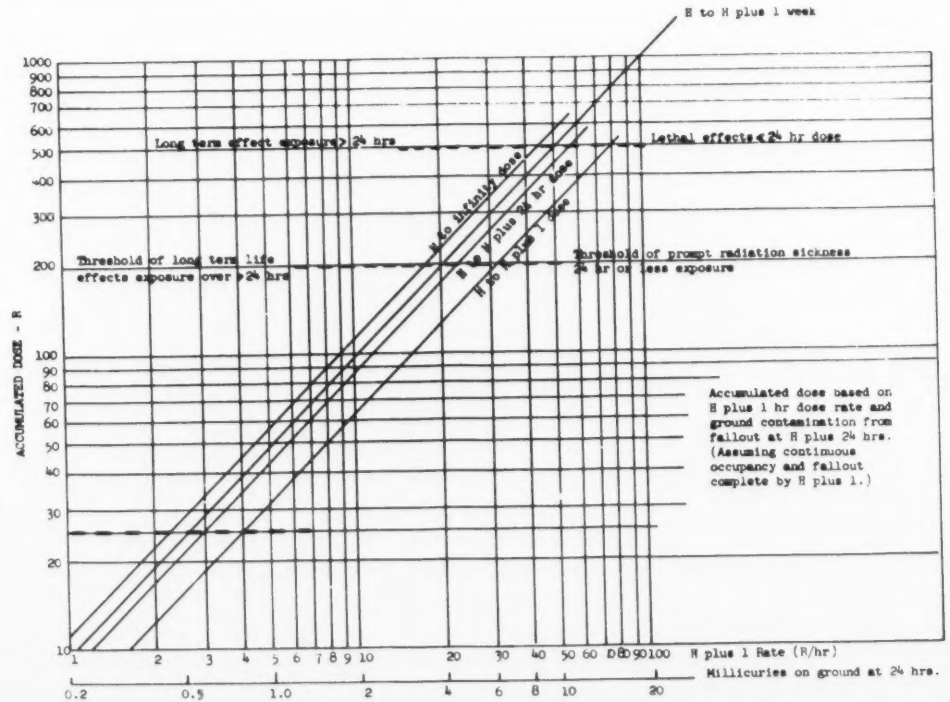

Figure 1. Accumulated whole body external air dose from beta-gamma emitters at various dose rates and concentrations.

protection against uranium components. In the presence of fission products or large quantities of unfissioned material emitting beta-gamma radiation, it is possible to obtain a significant dose of external radiation in a short period of time. In contrast, alpha-emitting materials do not constitute an immediate hazard, and a contaminated area may conceivably be occupied continuously, provided certain basic procedures are observed. Plutonium and uranium become a major hazard to health following a nuclear incident only if they enter and remain in the body.

Table 2. ***Alpha contamination (plutonium) and survey instrument indications****

Surface contamination (mcg/m^2)	*Equivalent alpha activity (dpm/m^2)*	*Permissible time of continuous exposure*	*Radiac indication*			*Remarks*
			JUNO (mr/hr)	*PAC 2G or PAC 3G (cpm)*	*PAC 1S (cpm)*	
10	1.4×10^6	Infinite	5	3,000	4,000	
100	1.4×10^7	Infinite	50	30,000	40,000	Materiel must be decontaminated to a value less than this for routine use in military establishments.
330	4.6×10^7	Infinite	165	100,000	133,000	Threshold of concern for some situations (crops).
1000	1.4×10^8	Lifetime	500	100,000 (probe 2/3 covered)	400,000	Beyond this value, areas and equipment must be decontaminated. Respiratory protection indicated.
4500	6.3×10^8	5 days	2250	67,500 (probe 1/20 open)	1,800,000	
9000	1.26×10^9	1 day	4500			

*Conversion to other radiac type instrument indications may be made if efficiency and geometry are known, using alpha activity as basis. Uranium or other alpha emitters may be judged from alpha activity, not micrograms.

mcg/m^2=micrograms per square meter

dpm/m^2=disintegrations per minute per square meter

mr/hr=milliroentgens per hour

cpm=counts per minute

Detonation or ignition of plutonium or uranium produces a cloud of radiologically contaminated dust and smoke, moved by the wind. Field experiments conducted by the Air Force Special Weapons Center and the Atomic Energy Commission indicate that even though personnel caught in the path of this cloud breathe its contents, only under extremely rare conditions will such exposure lead to a body burden of radioactive material greater than the lifetime permissible concentra-

tion.[13] It must be remembered that lifetime permissible concentrations are designed to insure that the individual will have no demonstrable effects as the result of such exposures, and do not represent finite values between safe and disease-producing conditions. As a matter of good practice personnel should avoid entry into, or prolonged exposure in, such a cloud; but there should be no such hesitation on the part of crash, rescue, and salvage personnel, even without respiratory protection, if the situation warrants such action.

Although the permissible exposure time for hand contact with chunks or masses of plutonium is 1½ hours per week without gloves, a contact hazard may be expected from plutonium dust, particles of which may get into cuts or under the nails and be retained there. Rubber surgical gloves under heavy Air Force work gloves will permit prolonged work with plutonium and uranium, and should be used by salvage and recovery personnel when indicated. Contaminated equipment and material can be satisfactorily processed, and clothing may be laundered, within the limits of existing directives. However, this relates to a single emergency situation only, and should not be construed as applying to prolonged industrial operations, which require more detailed industrial hygiene and health physics surveillance and contamination control. This is also true of the following over-all procedures and actions related to chemical hazards.

OTHER CHEMICAL HAZARDS

A number of other chemicals present in weapons may constitute a personnel hazard because of their chemical toxicity or explosive nature. Inhalation of lead fumes or lead-bearing smoke may result in toxic concentrations in the body. The thermal decomposition of products of high explosives may produce smokes that are irritating to eyes and nasal passages. Other materials may also be present that can produce caustic burns of the skin or smokes and fumes irritating to the eyes, the nasal passages, or the lungs. Regular protective clothing and breathing apparatus provided for fire fighters will give protection against these materials. In handling and recovery operations, personnel working with nuclear weapons components or weapons debris should use appropriate protective clothing to avoid possible harmful effects from these chemical hazards. Competent industrial hygiene engineers assigned to the medical service should be available to provide necessary surveillance and precautionary measures.

Detailed information on the particular weapon involved is available, and should be obtained to determine what materials are actually present. In the Air Force, the Command surgeon's offices, as well as

munitions personnel, should have this information readily available. It is extremely important that medical officers know which chemicals are present so that symptomatology resulting from these components is not wrongfully attributed to ionizing radiation.

MEDICAL, LEGAL, AND CLAIMS ASPECTS

Claims for damages resulting from a nuclear incident fall into 2 general classifications: direct causation and indirect causation. The former includes effects on persons, animals, or property resulting from direct exposure in the accident or incident. The latter are claims that result from apprehension or suspected damage, even though no actual injury has resulted.

In direct causation, the more obvious injuries result from the impact of the carrying vehicle or weapon, or from the explosion or the resulting fire. Corrosion effects of thermal decomposition products or chemicals used in combating the primary danger, effects of ionizing radiation on animals or humans, atmospheric contamination, and land contamination by radioactive materials or toxic chemicals and hazardous substances may also be direct causes of injury or damage.

Even though actual damage or contamination has not resulted, apprehension on the part of affected persons in the vicinity may cause submission of claims, or create unfavorable public opinion. Among the damages from indirect causation are expenses connected with medical examinations for possible radiation contamination or other exposure, and with concomitant loss of time. Similarly, loss of time from work for medical examinations to prove or disprove physiologic damage resulting from exposure to materials involved in the incident is a valid claim from this standpoint. Furthermore, loss of use of land or property due to suspected contamination may be a valid claim. For example, if a weapon was involved in an aircraft crash and smoke from the resulting fire drifted into a peach orchard just at the time of harvest, loss of the crop due to apprehension over possible contamination might be a valid claim.

Any accident response plan must include procedures necessary to determine which areas are not contaminated to reassure the public, in addition to assessing actual findings of contamination.

ORGANIZATION FOR ASSISTANCE AND RESPONSE TO "BROKEN ARROW"

Each Air Force base is required, under AF Regulation 355–7 [14] and pending DOD-AEC agreements, to develop the capability to cope

with nuclear weapons incidents. Similarly, AEC Operations Offices are required to maintain emergency radiologic assistance teams. To deal with situations in which local resources might not be adequate, the Department of Defense and Atomic Energy Commission have established a comprehensive system of response. The Joint Nuclear Accident Coordinating Center at Albuquerque, New Mexico, is operated by the AEC Albuquerque Operations Office, in conjunction with the Defense Atomic Support Agency, Sandia Base, New Mexico. This Center maintains information on both Atomic Energy Commission and Department of Defense capabilities, including the location of established teams and equipment; maintains telephonic communication among interested agencies in the Albuquerque area; and is the principal point of contact between the Atomic Energy Commission and the Department of Defense on mutual support requirements when nuclear incidents occur. Each AEC region has established emergency radiologic assistance teams, which consist of specialized personnel available for dispatch to aid AEC installations, state and local agencies, private industry, and others involved in non-weapons incidents; or on proper request through prescribed military channels to the Joint Nuclear Accident Coordinating Center, to assist a military unit in a weapons incident. The U.S. Public Health Service also maintains liaison with the Atomic Energy Commission and with the military surgeons general through the Command Post at the Pentagon, and by direct contact. This agency is prepared to dispatch qualified public health service radiologic health specialists, with equipment, to assist local or state health agencies in a non-weapons incident occurring in a civilian community, or a weapons incident occurring off a military reservation in an area under civilian jurisdiction.

At Headquarters SAC and at each numbered Air Force or comparable headquarters a disaster control team has been established. The Headquarters SAC team is headed by a major general, the SAC director of materiel, and at numbered Air Force level by a senior officer, usually the deputy director of operations. The team consists of a medical officer trained in nuclear medicine and casualty care; a sanitary and industrial hygiene engineer of the medical service experienced in health physics, hazardous toxic chemical detection and environmental surveys; munitions specialists familiar with weapons design; munitions specialists qualified in explosive ordnance disposal; an operations analyst qualified in weapons phenomenology; a disaster control officer and assistant qualified in radiation detection monitoring and surveys; an information services officer trained in the policies and procedures for handling news releases regarding weapons

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incidents and other disasters; a civil engineering representative capable of assessing damages to installations or civil property and providing assistance to affected activities in early restoration; and flying safety officials, representatives of the Judge Advocate's Office and other agencies as necessary. Teams are equipped with radiation detection and environmental sampling equipment, and protective clothing, suitably packaged for air transportation if it should be necessary to send the team to the site of an accident. Suitable

Table 3. ***Medical service equipment***

Stock number	*Item*	*Quantity*
8WAA–702900	Radiac meter, beta-gamma, AN/PDR–27A (low-range beta-gamma; 0–5000 mr/hr)	1
8WAA–698900	Radiac meter, x- and gamma ray, pocket chamber (200 mr gamma)	10
6665–581–2227	Radiac meter, alpha survey, gas flow portable, Eberline, PAC–2G or equal (100,000 dpm—alpha)	1
8WAA–082000	Charger, radiac detector, self-contained type PP–311A/PD	1
8WAA–380000	Holder, assembly detector element SS (film badge), w/film packets (up to 1r)	25
8WAA–NSL (6555–NL0002)	Alpha, beta, gamma radiation survey meter, Tech. Assoc. Juno Model SRJ–6, or equal (0–5000 mr/hr; 5,000,000 dpm alpha)	1
6665–625–7571	Staplex Hi Volume Air Sampler, w/filter papers, Staplex Mfg. Co., or equal (up to 20 cfm)	1
NSL	Gast Air Sampler (AEC Model), or equal, w/millipore Aerosol filters (up to 10 liters/min)	1
NSL	Uni-jet Air Sampler, complete with millipore filters and 1 doz freon refills, Union Ident Equip Co., or equal (approximately 1 cfm)	1
NSL	Count Rate Meter, Nuclear Chicago Labitron, or equal, with thin end window GM detector mount, sample charger, and planchets (20,000 cpm)	1
6665–580–3020	Radiac set, Alpha PAC IS	1

mr/hr = milliroentgens per hour
dpm = disintegrations per minute
cfm = cubic feet per minute
cpm = counts per minute

alternates for team members are designated and procedures have been established at Headquarters SAC and subordinate headquarters for prompt activation of the team on a no-notice basis, 24 hours a day. Air transportation is available on a stand-by basis and experience has shown that, when required, the team may be activated and airborne within 30 minutes of receipt of information from an affected installation. A list of equipment normally available for these teams is shown in table 3.

Each base is required to have a disaster control team with similar composition, supported by security personnel (air police), medical personnel (ambulance drivers, physicians, medical technicians, industrial hygiene engineers, and preventive medicine technicians), fire fighters, and other needed personnel.

The disaster control teams are responsible for assessing information on an incident occurring on or near a SAC base or as result of SAC operations, and giving on-the-scene aid to base teams; observing base teams in action to evaluate their training and performance; or in an off-base incident, providing on-the-scene liaison between Headquarters SAC and other agencies involved, such as the Atomic Energy Commission, Public Health Service, or local responsible officials.

BASE OR LOCAL LEVEL RESPONSE

Although the following suggestions are based on SAC procedures, and are oriented towards an incident involving a weapon, aircraft, or missile, they can be applied to any nuclear weapons incident, or modified to fit any type of accident involving radioactive hazards. These procedures are similar in many ways to those recommended for any large industrial disaster and are an extension of normal base fire and emergency operations plans. Since a nuclear incident would be among the more serious types of problems that base disaster plans might face, if base teams are prepared to meet such a situation, satisfactory response to other less serious situations should be assured.[15]

Effective response to a nuclear weapons incident requires 3 equally important but related command and control functions: (1) a workable, rapid communications system to provide an alert and the information necessary for continuing direction of the control operation; (2) a disaster control command post capable of assessing the situation and directing necessary measures for countering effects of the disaster; and (3) well-trained and organized personnel at the site of the occurrence, who arrive as rapidly as possible, and work under the direction of a qualified on-the-scene controller.

Disaster control operations may also be divided into 3 phases. Discovery of the incident, alerting of required responsible agencies, activation of the disaster control teams, notification of higher headquarters, and the other measures necessary to activate disaster control operations make up the first phase (fig. 2). The second phase is the immediate reaction phase, which includes fire fighting, other emergency countermeasures to secure the area and evacuate

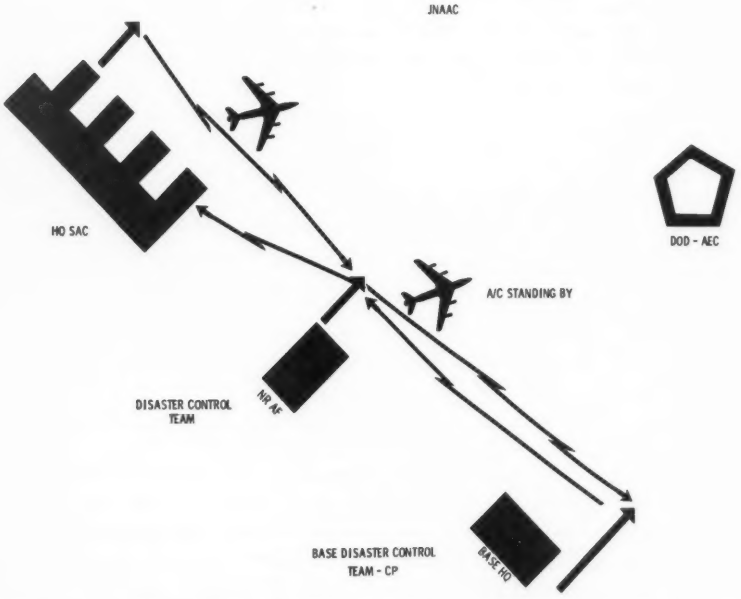

Figure 2. Discovery and notification phase. A/C: aircraft standing by; JNACC: Joint Nuclear Accident Coordinating Center; NR AF: numbered Air Force; CP: the command post.

personnel from potentially hazardous situations, rescue and emergency medical treatment of casualties, precautions to prevent further damage to facilities or personnel from detonation of explosives, and assessment of the immediate radiation or other toxic hazards, if any (fig. 3). This phase also includes interim measures taken by information services. If the incident occurs off base, the need for prompt and proper coordination with civil authorities requires considerable pre-planning. The third phase is restoration of damage, and includes

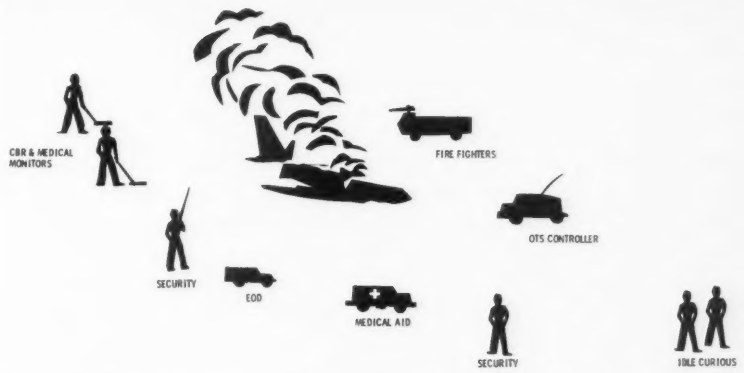

Figure 3. Reaction and countermeasures phase. CBR: chemical, biologic, and radiologic monitors; and EOD and OTS explosive ordnance disposal and on-the-scene controllers, respectively.

salvage and recovery of weapon system components, removal and clearance of debris, decontamination of areas and materiel, repair to damaged facilities, and the environmental sampling and analysis that is required whether or not contamination has occurred (fig. 4).

Figure 4. Cleanup and restoration phase.

In most circumstances no fine line may be drawn between these phases. Certain functions will be initiated in advance of others if the situation permits. The entire objective of the military disaster control operation is to minimize the effect of the disaster on immediate operational capability and to restore operational capability of the base or unit as soon as possible. In order to do this, the on-the-scene controller, disaster control personnel at the scene, and the disaster control staff must be highly competent and well qualified.

MEDICAL SERVICE ACTIONS AND RESPONSIBILITIES

Although many agencies are involved in coping with a nuclear accident, the burden of responsibility inevitably falls upon the medical service. In the Air Force, the medical service has responsibility for radiologic health matters as well as over-all recommendations on preventive and occupational health problems. Medical service responsibilities include care and treatment of personnel exposed to radiation or chemical hazards, or otherwise injured as the result of an accident or incident; advising the commander and disaster control personnel on hazards and exposure situations, criteria for control of exposure, and requirements to meet them; participation in required alpha and beta-gamma surveys in conjunction with other disaster control personnel; collection of air and other environmental samples from the area involved in the incident, by sanitary and industrial hygiene engineers and preventive medicine technicians; analysis and evaluation of biologic specimens from persons exposed; and all routine health physics activities and industrial hygiene surveillance over personnel engaged in salvage and recovery operations.

PERSONNEL MONITORING

All disaster control personnel participating in the immediate reaction phase should be provided with suitable personal dosimetric devices such as the pocket dosimeter, film badge, or DT–60 Dosimeter. Although these devices do not detect the presence of alpha contamination, in work close to intact weapons components where there is emission of small amounts of gamma radiation, the whole body dose may be estimated from these devices and appropriate entries made at the conclusion of the operation in the individual's DD Form 1141, "Record of Exposure to Ionizing Radiation."

In the event of a contaminating accident, personal monitoring is required for each person working with debris or in clean-up operations,

if there is reasonable possibility of his receiving a weekly dose greater than 25 percent of the permissible limit prescribed in title 10, Code of Federal Regulations, Atomic Energy, part 20, "Standards for Protection Against Radiation." Although use of the weekly dose limitation has been changed to a quarterly limit of 3 rem in 13 weeks, ¼ of the 300 millirem per week value or 75 millirem is a useful guide in requiring use of dosimeters. As defined in paragraph 2.202 of the Code of Federal Regulations, personal dosimeters should also be worn by personnel entering a "high radiation area," defined as one in which a major portion of the body could receive, in any 1-hour period, a dose in excess of 100 millirem. Use of protective procedures should be considered in estimating dosimetry requirements.

Personal monitoring is not required on a routine long-term basis in a clean-up operation if calculations by competent health physicists or radiologically trained sanitary and industrial hygiene engineers indicate that the average weekly dose over an 8-week period is less than one tenth of the permissible exposures established by the National Committee on Radiation Protection and Measurements. On the other hand, regularly scheduled monitoring of the contaminated site is required if there is a reasonable possibility that permissible air concentrations from alpha emitters or from fission products exceed one tenth of the maximum permissible activities in air.[8]

One of the most practical and reliable indications of body uptake of radioactive material is from examination of urine specimens at an appropriately equipped radiochemical laboratory. Urine specimens should be 24-hour specimens. This sample is the collection of all voidings excluding the first jet of the morning of the day of collection and including the first morning sample of the second day. Instructions should be obtained from the laboratory performing the examination as to type of container to be utilized and method of preservation, if any, of the specimen. In the Air Force, samples are sent to the USAF Radiological Health Laboratory, Wright-Patterson Air Force Base, Ohio. These examinations indicate exposure only, and do not give any actual information about damage or injury. Findings of less than the threshold value indicate that no significant exposure has occurred. Findings greater than those recommended merely indicate that an uptake of radioactive material of significance has occurred. The following information on suggestive findings was prepared by the Los Alamos Scientific Laboratory:[15] With regard to plutonium, 0.2 disintegration per minute per 24-hour sample indicates that not more than one fifth of the permissible body burden has been absorbed. A finding of 14 disintegrations per minute in a 24-hour sample taken 30

days after exposure indicates absorption of approximately a permissible body burden of this material (0.044 microcuries). In the case of uranium, a finding of 20 disintegrations per minute in a 24-hour sample is considered a positive indication of enriched uranium in the body. In an accident situation, 200 disintegrations per minute from such a sample would suggest uptake of the material during the accident operation. Results of urinalyses should be indicated in appropriate military and civilian medical records.

Routine blood examinations will be of little value if exposures of less than 100 roentgen air dose have occurred. According to USAF School of Aviation Medicine reports[7] the total white blood cell count per cu mm indicates the seriousness of radiation sickness symptoms in a subject exposed to radiation. If the blood of a radiation-exposed person shows a total white blood cell count above 2500 per cu mm only minimal effects should be expected; with a count below 1000 per cu mm severe symptoms will occur. Routine periodic hematopoietic examinations should be conducted for 3 months on all persons who are suspected of having received exposure to external whole body radiation greater than 100 roentgen air dose, with particular emphasis on the period between the twentieth and the fortieth day after exposure.

When an actual contamination is demonstrated, urine samples should be collected from those workers who have been within the most highly contaminated locations. Random samples from persons known to have been in areas where contamination was below the permissible levels and representative samples from persons who are known to have been in completely unexposed locations should also be collected. Approximately 1 year following an accident, random samples from persons working throughout the base should be evaluated to assure that no unsuspected uptake of material is occurring. Although not a precise method, it is highly recommended that nasal swabs be taken from personnel who work in the accident situation or in salvage and recovery operations. A filter paper–tipped applicator may be used as the nasal swab. After swabbing, the paper is examined with an alpha detector. These swabs will give some indication of whether or not radioactive material has been inhaled. Fecal, biopsy, and total body counting studies may be a part or extension of these procedures when indicated and when facilities are available.

Even though contamination is not found after a weapons component incident, representative biologic samples should be collected from personnel in the most exposed areas and submitted for evaluation, along with environmental samples. This negative information is essential in protecting both the interests of the government and the persons concerned.

ALPHA CONTAMINATION MEASUREMENTS AND PERMISSIBLE EXPOSURE LEVELS

Detection of alpha contamination is complicated by the short range of alpha particles in air and inherent difficulties associated with the field survey radiac instruments designed for detection of these particles. Field instrument readings indicate the presence of radioactivity. For a closer approximation of the amount of activity present, such factors as the geometric relationship of the detector to the contaminated surface and the electronic efficiency and characteristics of the detector must be considered. Contamination limits for alpha-emitting materials are generally given in terms of micrograms of material per square meter of surface or cubic meter of air, or in corresponding disintegrations per minute.

Studies of alpha contamination made under joint DOD-AEC auspices, particularly research projects under the jurisdiction of the Air Force Special Weapons Center, have indicated that an area contaminated with up to 1000 micrograms of plutonium per square meter, or the equivalent amount in terms of hazard of other alpha emitters such as uranium, can be occupied continuously over prolonged periods of time. Under ordinary conditions of resuspension in the atmosphere and subsequent absorption into vegetation, 1000 micrograms per square meter will not produce a body uptake greater than a lifetime maximum permissible concentration. Under these conditions, 1 disintegration per minute in the atmosphere, detected after standardized collection and analysis, is roughly equivalent to 1 microgram of plutonium per square meter. Since plutonium is much more hazardous than uranium compounds, precautionary and evaluation measures designed for plutonium will be sufficient for any hazards associated with uranium.

Studies have indicated that an area containing 4000 micrograms of plutonium per square meter could be occupied for up to 8 days without accumulating a lifetime maximum permissible body burden, and approximately 3 to 4 days' occupancy would be required in an area containing 5000 micrograms of plutonium per square meter to reach such a threshold concentration [12] (table 2). The difference in the hazard from plutonium and uranium may be estimated from the specific activities of the materials. There are approximately 16 grams of plutonium^{239} per curie (1.4 times 10^{11} disintegrations per minute per gram) and 467,000 grams of uranium^{235} per curie (4.7 times 10^{6} disintegrations per minute per gram).

Atmospheric and other environmental samples must be collected and analyzed even when surveys or weapon observations indicate that no

active material has been disseminated. Atmospheric samples for analysis for radioactive contamination should be collected using high-volume air sampling equipment provided medical service personnel. If this equipment is not available, electrostatic precipitators provided for sanitary and industrial hygiene engineers may be used. The Staplex high-volume air sampler and the Gast Air Sampler are suggested for this purpose and are authorized in current medical supply documents. Air contamination can be only approximated during the first 24 hours following an alpha-contaminating event since naturally occurring alpha emitters, principally radon, accumulate on the collecting paper and must be allowed to decay. Information on decay rates and radioactivity occurring naturally in the atmosphere has been published by the National Bureau of Standards.[16] In submitting atmospheric samples to the laboratory, the time of the accident and time of sample collection should be indicated. Radioactivity may be roughly approximated using field survey equipment if the volume of air passed through the collecting medium is known. A portable laboratory-type scintillation alpha counter is available at Headquarters SAC and at Headquarters 7th Air Division. Numbered Air Force Headquarters have been provided with thin end window Geiger-Müller Count Rate Meters where efficiency for alpha counting has been computed.

Swipe samples of equipment or material may be made using Whatman No. 40 filter paper. In collecting such samples, light finger pressures should be used. A piece of the filter paper approximately 4 inches square is used to swipe an area of 150 square centimeters, or approximately 4¾ by 4¾ inches square. In making the swipe, the piece of filter paper is placed over the area, rubbed back and forth gently 2 or 3 times, and lifted out. Such swipes may be field evaluated with survey equipment and then forwarded to the appropriate laboratory.

Among the survey instruments that may be used to detect alpha contamination are the Juno SRJ–6 and the PAC–2G Gas Flow Proportional Counter. With the PAC–2G instrument, 30,000 disintegrations per minute (dpm) on the scale is equivalent to approximately 100 micrograms of plutonium per square meter when the probe is held between ½ to 1 inch above the contaminated surface; 100,000 dpm (full scale deflection) equals 330 micrograms of plutonium per square meter. If ⅔ of the probe is covered with cardboard or heavy-gage aluminum foil, 100,000 dpm equals approximately 1000 micrograms of plutonium per square meter. Calibration tests at Headquarters SAC have shown that with low levels of beta or gamma present, such as 1 to 50 milliroentgens (mr) per hour emitted

from intact plutonium or uranium, 1 mr per hour scale deflection using the Juno SRJ–6 is equal to approximately 1000 counts per minute. The Juno should mainly be used to detect the presence or absence of alpha and not to establish definite amounts of contamination. The probe of the AN/PDR–27 beta-gamma survey meter contains a thin end window Geiger-Müller tube that will detect alpha particles with energies greater than 2.6 mev. Measurements with shield off and shield on are necessary to separate alpha levels from beta-gamma levels. Since alpha particles emitted by uranium have energies greater than 4 mev, as do those emitted by plutonium, some indications of alpha activity may be obtained with this instrument. Surfaces to be monitored for alpha activity must be free of moisture since even a small amount of dampness will seriously interfere with accuracy of measurement because of the shielding effect of water or other liquid.

Alpha-emitting radioactive material does not constitute a major hazard unless the material can enter the body. Inhalation is by far the greatest hazard. When contamination is present, it is necessary to evaluate over-all radiologic hazards carefully in order to recommend the necessary protective measures. Although 1000 micrograms per square meter is a satisfactory criterion for determining whether or not contamination exists, efforts should be made to reduce the removable radioactive contamination of material and equipment to accepted levels before they are released. Recommended limits for release to activities within the Air Force or Department of Defense include 500 dpm per 150 square centimeters as measured with an appropriate alpha survey meter (Los Alamos Scientific Laboratory),[17] 100 dpm per 100 square centimeters (U.S. Naval Radiological Defense Laboratory), and 30 dpm per 100 square centimeters (Oak Ridge National Laboratory). Obviously, when dealing with actual contamination affecting crops or material, detailed on-the-spot health physics and public health evaluations must be made. Because of the nature of alpha contamination, these decisions can be made calmly and deliberately, after careful analysis of the problem.

RADIOACTIVITY ASSOCIATED WITH DAMAGED OR INTACT WEAPONS COMPONENTS

In a weapons incident intact components may emit weak beta-gamma activity as well as some alpha particles, and fragmented pieces of the weapon may also be present. Collection and proper disposal of these items is the responsibility of emergency ordnance disposal personnel. When such materials are discovered in the course of

surveys and investigations are made during emergency and follow-up periods, they should not be a cause for alarm. If medical service monitors and survey personnel discover such items—and they should be on the alert for them—the on-the-scene controller should be notified so that the necessary security and emergency disposal procedures may begin.

WARNING SIGNS

Actual exposure hazards should be carefully evaluated before deciding to place radiologic hazard warning signs around an area. In most cases, the simple measures required for alpha contamination control will eliminate the need for any warning signs. Careful health physics evaluations should be made before releasing any material that is contaminated. Because of natural public apprehension about radiation, great discretion should govern decisions to post an area as contaminated by radioactivity. This is particularly true since normal security measures should keep unauthorized personnel from entering the area.

DECONTAMINATION AND DISPOSAL OF RADIOACTIVE WASTES

Salvageable material that has become contaminated with either fission products or alpha-emitting materials will usually not be released from Department of Defense or Atomic Energy Commission control. Within the Air Force, such items should be reported to the Air Materiel Command for disposition, as outlined in Technical Order 00–110A–N–2.[18] In a non-weapons accident, cleanup and waste disposal procedures will be based on the radiologic danger from the material involved, its half-life, and the over-all hazard, including chemical toxicity. In most instances, equipment and material involved in a plutonium- or uranium-contaminating event can be operated satisfactorily with no special treatment other than ordinary cleaning or washing. Waste water from decontamination and washing operations should be disposed of by such procedures as dilution and dispersion, taking advantage of environmental factors where possible. The average concentration of radioactive material in air or water at the supply point, prior to use by humans, should not exceed 10 percent of maximum permissible levels.[8] Concentrations lasting for only a few days, however, may be allowed to exceed these values, provided the average concentration over the next 12 months does not exceed 10 percent of permissible amounts.

Simple procedures for fixation and decontamination can be performed by most civil engineering personnel at military installations. These include: washing smooth surfaces with water and detergent; plowing land areas; using rapid-cure road oil to fix the contaminant and scraping up fixed material; painting over smooth surfaces with a heavy base paint; and applying adhesive materials. Persons performing these operations should use proper respiratory protection and the necessary industrial hygiene and radiologic health surveillance should be provided.

ENVIRONMENTAL SAMPLES

In addition to air samples, environmental samples that should be collected from the scene of a nuclear incident include leaves of trees and plants, grass, smears from buildings or other sites, and flat objects on which contamination may have settled or would be likely to settle. These should be collected for at least 1500 feet downwind, as well as 500 feet upwind and crosswind in the case of a noncontaminating event. Samples should be collected as far as the periphery of the area of detected contamination in a contaminating event. Additional specimens should include swabs made with filter paper from the soles and seams of shoes of personnel working in the accident scene, soil samples of not less than 3 to 5 ounces, and water samples from streams, ponds, or puddles. Preliminary assessment of these samples may be made with field survey equipment, but they should also be examined in a laboratory equipped with appropriate counters and laboratory-type equipment.

PROTECTIVE EQUIPMENT

Unless the presence of contamination has been definitely established, standard work clothing and overshoes will give sufficient personal protection in the immediate period of operation after a nuclear weapons incident. The standard Department of Defense gas mask will provide adequate respiratory protection for operations that must be performed in areas where contamination is definitely established. On the other hand, personnel engaged in cutting up, burning, or similar salvage and recovery operations, which generate large volumes of potentially contaminated dust, should be provided with air respirators and suitable protective clothing, gloves, and bootees. These are all standard Department of Defense–approved items available for issue.

SUGGESTED DISASTER CONTROL SURVEY EQUIPMENT

The Department of the Air Force has published an equipment component list for base and numbered Air Force headquarters teams (USAF Equipment Component List 432). In addition to the equipment specifically authorized for disaster control teams, radiation detection and environmental sampling equipment are authorized in medical service equipment component lists (ECL's) and special lists of equipment (SLOE's) for use by sanitary and industrial hygiene engineers and health physicists. Equipment authorized for the medical service (table 3) is the minimum that should be available and should be operated by medical service personnel in conjunction with the base disaster teams. The equipment must be stored in a convenient location, accessible for prompt dispatch to the scene of an incident, and for use in the medical facility receiving patients from such an incident. The medical service aluminum field chest is the most suitable of the standard military supply items that can be utilized for carrying this equipment. Batteries must be checked frequently and spares should be available. All equipment used for radiation surveys must be calibrated frequently to ensure that it operates properly.

ACTIONS REQUIRED BY AN ACTUAL INCIDENT

The following checklist summarizes recommended actions in event of an incident. It may be used as a guide in developing and in performing the necessary procedures to cope with weapons incidents. The actions of the various agencies involved are also summarized.

1. When notification of an incident is received, its location should be determined on a suitable map, such as the base crash map, and the installation's disaster control team should be alerted.

2. Initial actions similar to those required for any other major aircraft accident or serious occurrence should be performed, amplified as necessary because of the increased hazard that exists from the presence of the weapon.

(a) The medical service and other staff should proceed to the disaster control command post, reporting to the disaster control officer.

(b) Ambulances and emergency personnel (security, fire fighters, sanitary and industrial hygiene engineer, emergency ordnance disposal, etc.) should be dispatched with radiation detection and environmental sampling equipment.

(c) The medical facility should prepare to receive casualties and emergency surgical teams and other emergency treatment units should be activated. Unless otherwise indicated, normal hospital functions, other than those directly involved in dealing with the incident, should continue.

(d) Medical facilities should be alerted if the disaster appears to threaten the hospital or patients by reason of its proximity to the hospital or facility, or because of danger from fire or detonation of high explosives. Other activities,

such as maintenance, should remove threatened aircraft or materiel, or prepare to do so.

(e) Medical service beta-gamma survey meters, such as the AN/PDR–27 retained in the hospital, should be checked and placed in operation.

3. When the medical service team arrives at the scene of the incident, the senior medical representative should report to the on-the-scene controller and the team should prepare to receive casualties from rescue personnel. Medical service monitors should perform radiation surveys jointly with other monitoring personnel, and the initial collection of environmental samples should be begun as soon as possible.

4. Air police or other security forces should be responsible for maintaining free and unhampered access for emergency vehicles, and at the same time for restricting access to the area by unauthorized individuals who may be endangered by the incident. They should also be responsible for evacuating all disinterested personnel from within the 1500-foot minimum safe distance line. Normally, access inside this area should be limited to fire department, medical personnel, monitoring teams, explosive ordnance disposal personnel, maintenance personnel, chaplains, and similar personnel. If military or civilian housing is downwind from the disaster scene and lies within the safe distance line, air police should be prepared to help evacuate military personnel and their dependents, or advise and work with local civilian law agencies with regard to off-base, nonmilitary housing, under instructions from the disaster control officer. Medical service representatives must be prepared to advise the on-the-scene controller, and through him the disaster control command post, regarding any contamination found, and the significance of such contamination.

5. Although a remote possibility, if beta-gamma monitoring with AN/PDR–27 or AN/PDR–39 reveals a low order of nuclear detonation or presence of fission products or gamma-emitting materials, the potential dose should be estimated immediately. If it appears that essential personnel remaining at their location for 24 hours will receive a dose of whole body radiation in excess of 25 rem, they should be removed to unexposed locations for a period of several hours. The situation can then be re-assessed and the area reoccupied. This should be done in all instances except where emergency operations are needed to prevent a more serious or greater exposure; this must be a command decision based on existing circumstances. (If rates as high as 50 milliroentgens per hour are detected on fragments of debris, they are probably unfissioned weapons components.) Nonessential personnel should already have been excluded or removed.

Note: An H plus 1 dose rate of 4 r per hour is equal to 25 r accumulated from H to H plus 1 hour, and a dose rate of 2.9 r per hour at H plus 1 is equal to 25 r in 24 hours (fig. 1). In a serious situation, doses of 100 rem can be taken without hesitation. Again this should be a command decision based upon medical service recommendation.

6. In event of a fission yield, DT-60 dosimeters or film badges should be read as soon as possible after the recovery operation is completed. Information from these badges should be included in the individual's DD Form 1141, "Record of Exposure to Ionizing Radiation." Persons receiving doses greater than 25 rem but less than 100 rem should be instructed to report for a periodic medical evaluation approximately once every 3 to 6 months. This evaluation will include a complete blood count and differential.

7. Alpha monitoring should be begun as soon as possible and if contamination is found, necessary decisions can be made calmly and without haste. The thresh-

old of contamination is 1,000 micrograms per square meter. With the PAC-2G alpha survey meter, this is represented by full-scale deflection on a maximum scale with two thirds of the probe shielded.

8. If possible, air samples should be taken during the emergency phase immediately after the incident occurs, and before, during, and after salvage, recovery, and decontamination operations. These samples should be evaluated with field survey equipment after allowing time for naturally occurring radioactive materials to decay; they should then be sent to the laboratory. The required environmental samples should be collected as soon as possible after the emergency phase of the incident is completed.

9. Patients should be monitored, but treatment should not be delayed because contamination is present on clothing or bodies. Such contamination can be removed either after or during required therapeutic procedures. Contaminated clothing should be placed in a suitable container, such as a GI can or polyethylene bag, and can later be laundered in an Air Force– or Department of Defense–approved laundry or buried in a proper disposal site. After contaminated personnel are received at the medical facility, monitoring should be performed and any contaminated areas subsequently cleaned up.

10. If, after the weapon becomes engulfed by fire, the fire marshal recommends withdrawal of personnel to the on-the-scene controller, instructions for evacuation should be issued by public address system, roving air police patrols, and oral signals. Medical service personnel should comply with such withdrawal instructions.

11. Medical service representatives, usually the sanitary and industrial hygiene engineers, should work with the civil engineering bomb damage recovery team and make necessary recommendations regarding temporary fixation of alpha contamination. This can be done by soaking with a fine water spray or spraying paint or a heavy oil over the surfaces. Permanent fixation of contamination can be obtained by resurfacing with asphalt or concrete, or by scraping and removing the surface after temporary fixation. Decontamination of hard surfaces of buildings, vehicles, and aircraft can be achieved by scrubbing with water and detergents. Land surfaces may be decontaminated by plowing, scraping, oiling, or by adding fill.

12. All requests for information and all contact with public news media should be through the base information service officer's representative. Medical service personnel should exercise maximum courtesy in handling such requests but direct the person seeking the information to the authorized information service representative.

13. Informal contact should be made with the local health officer and local hospitals when civilian communities or personnel are involved in the incident. If contamination that affects crops, foodstuffs, or water supplies is detected, the senior medical service representative should advise the disaster control team chief immediately, and the necessary health department agencies should be notified.

SUMMARY AND CONCLUSIONS

Peacetime nuclear weapons incidents may result in radioactive contamination from plutonium and uranium. The release of gamma rays as the result of a near critical condition of nuclear components is a potential hazard. Certain materials involved in weapons are hazards because of their chemical nature. Plutonium is a more serious prob-

lem than uranium, and necessary protective measures taken against plutonium will eliminate any problems from uranium. Exposure to beta-gamma emitting materials may result in a significant dose of external radiation in a short period of time, but alpha-emitting materials, such as plutonium and uranium, do not constitute an immediate hazard. Plutonium and uranium become a health hazard in a nuclear incident only if these materials enter, and remain in, the body. Thus, an alpha-contaminated area may be occupied continuously provided basic procedures are observed. Personnel involved in salvage or weapons recovery operations should wear ordinary work clothing and protective gloves and, if the operation requires it, respirators. Possible radioactive contamination problems may be indicated early, even without survey instruments, if explosive ordnance disposal personnel report that weapons components either are intact or have been burned or affected in the incident. A major problem in a weapons incident is that of public relations, and all requests for information should be referred to the information officer.

Although possible incidents involving nuclear weapons or their components will continue to be a matter of concern for military medical personnel and certain of their civilian colleagues, there are adequate means for coping with such situations. Prompt and positive response and professional competence are necessary in order to minimize public apprehension and ensure that public health and safety are adequately protected. Such response can be achieved only through training in all aspects of the problem and through development of comprehensive, frequently rehearsed plans integrated at all levels.

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THE PRACTICE OF MEDICINE

The history of medicine has always demonstrated that the greatest advances in medicine occur when medicine becomes the prerogative of the physician. Medicine belongs to the trained physician, not to the politician, the insurance company, or the labor leader. The medical practice act has possibly solved many problems, and the maintenance of high standards of medical practice is a good thing; but the present trend of cooperation and sanction of ancillary persons dealing with the body and mind of sick people can only lead to decadence in the quality of medicine. Too many coexisting organizations and too many unqualified people have become private practitioners in the field of medicine. The unscientific and socialistic approach to medicine leads to physician-deterioration and patient-mortality whereas the scientific method leads to beneficial results.—Arnold Friesen: A Philosophy of Medicine. *Nebraska State Medical Journal*, November 1959.

Prophylactic Daily Hemodialysis in Acute Renal Failure

Reduction of Morbidity and Mortality

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WHEN ACUTE RENAL FAILURE complicates a surgical procedure or trauma, morbidity is severe and mortality ranges from 50 to 70 percent.[1-4] In the more "benign" instances of acute renal failure following obstetric accidents and ingestion or inhalation of nephrotoxic poisons, case fatality rates still range from 25 to 40 percent (table 1).[4] This degree of mortality prevails even with expert modern management and conventional use of hemodialysis with the artificial kidney.[5]

Recently, in the renal branch of this surgical research unit, 12 patients with acute renal failure have been treated with moderate fluid restriction, a normal diet, and prophylactic daily hemodialysis with an artificial kidney. Whereas the *conventional* indications for hemodialysis are based on definite or progressive clinical uremic illness or progressive potassium intoxication in the absence of impending or actual hemorrhage, *prophylactic* dialysis is applied on the indication of established oliguria before clinical uremia and blood chemical derangements occur, in order to prevent their occurrence. Through this new approach to management a striking contrast with past experiences has been observed in patients with acute renal failure. Clinically, uremia did not appear despite prolonged oliguria (400 ml in 24 hours, or less) and morbidity was dramatically reduced when compared with previous regimens. It is anticipated that patients who tend to improve or to remain well by virtue of such treatment

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Table 1. ***Mortality rates in acute renal failure***

Cause of renal failure	*Number of patients*	*Fatalities*	
		Number	*Percent*
Post-traumatic	242	160	66
Transfusion reaction	142	56	39
Nephrotoxin	137	44	32
Postpartum	270	82	30
Other	253	170	67
Total	1,044	512	49

may enjoy a vastly better chance of surviving. Since acute renal failure rarely occurs and since the demands of optimal management greatly exceed the justifiable capabilities of most hospital wards, the wisdom of concentrating patients, staff, and equipment at a renal center is clearly demonstrated.

METHOD

Hemodialysis with an artificial kidney is performed routinely, daily or as often as necessary, to *prevent* rather than to treat clinical and chemical abnormalities of acute renal failure. Dialysis is begun as early as the third or fourth day, and repeated as often as necessary to maintain symptomatic and biochemical control until diuresis is under way. Requirements for this procedure have been identified and met by means of (1) a skilled team, (2) a suitable dialyzer, (3) continuous cannulation of blood vessels, and (4) regional heparinization.

Skilled Team

Under a physician's supervision, 2 or more enlisted Army clinical technicians readily assemble the artificial kidneys (dialyzers) and circuits, perform dialysis, render needed nursing care, and maintain necessary supplies. Registered nurses may, of course, perform these duties. In any event, the previous requirement for medical officers to staff these highly specialized operations has been successfully met in large part by paramedical personnel.

Suitable Dialyzer

The MacNeill-Collins dialyzer requires less blood (only 250 ml) than

other currently available models to fill the circuit dead space. This advantage seems decisive if dialysis is to be done frequently. A low resistance to blood flow also permits dialysis without the use of blood pumps.

Continuous Cannulation of Blood Vessels

Ready access to the circulation is assured by leaving cannulas in place following the first dialysis. They are placed in 2 veins, in an artery and a vein, or in 1 vein if a multichannel cannula is used. They remain patent for many days by virtue of hourly instillations of heparinized saline between dialyses. During each dialysis, they deliver and accept an adequate blood flow rate, that is, 75 to 200 ml per minute.

Regional Heparinization

To apply dialysis in the early postoperative period, the former requirement for total heparinization of the patient's circulating blood has been eliminated by a technic that permits the anticoagulant to traverse only the extracorporeal circuit. Heparin is infused into the blood as it leaves the patient, and neutralizing quantities of protamine sulfate are infused into the blood as it re-enters the patient. These rates of infusion are regulated according to the blood heparin concentration in both the patient and the dialyzer, as measured by a rapid assay method [6] or by single-tube clotting time determinations of the patient's blood.

Dialysis is usually continued for 6 hours, after which the patient is permitted as much ambulation as his underlying disease or postoperative condition warrants. Likewise, every effort is made to support normal nutrition by providing as *normal* a diet as can be tolerated by the patient. Specifically, no restriction is placed on protein or potassium intake since excess metabolites can be removed by dialysis. Fluid intake is restricted to about 200 ml in addition to measured losses and what is ultrafiltered during dialysis. Daily weight determinations and clinical evaluation modify these general rules.

CLINICAL RESULTS

Since this technic was first available, 12 patients with acute renal failure due to acute tubular necrosis have been referred to the renal branch of this surgical research unit early enough to apply dialysis prophylactically (table 2). In the majority of cases, the dialysis lasted 6 hours and was performed in consecutive daily sequence.

CASE 1. A 19-year-old enlisted man suffered acute renal failure following heat stroke. Six consecutive daily dialyses were performed during 12 oliguric days.

CASE 2. A 25-year-old woman developed acute renal failure following open-heart surgery for an interatrial septal defect. The operative procedure was complicated by cardiac arrest requiring 9 electric shocks before heart action resumed. In the immediate postoperative period, a massive intrapleural hemorrhage occurred, requiring transfusion of 23 pints of whole blood. Vasopressor therapy was required during the first 2 postoperative days. Oliguria persisted for 12 days, during which 7 daily dialyses were performed.

CASE 3. A 23-year-old sailor suffered traumatic rupture of the spleen followed by shock and emergency splenectomy. Dialysis was performed 5 times during 10 oliguric days.

CASE 4. A 23-year-old soldier suffered a stab wound of the left chest, resulting in lacerations of branches of the pulmonary artery and requiring emergency thoracotomy, with ligation of the blood vessels and wedge resection of the involved portions of the pulmonary parenchyma. He remained oliguric for 13 days, and 7 consecutive daily dialyses, beginning on the seventh day, were carried out.

CASE 5. A 30-year-old man became severely oliguric and mildly icteric following ingestion of 120 ml of carbon tetrachloride. Oliguria lasted 22 days, during which time dialysis was performed 16 times.

CASE 6. A 30-year-old woman developed oliguria following a self-induced abortion. Diuresis occurred on the twenty-first day after onset, dialysis having been performed 10 times.

CASE 7. A 21-year-old man suffered multiple injuries following collision of his motorcycle with a locomotive. Oliguria lasted more than 3 weeks, during which 18 dialyses were performed.

CASE 8. A 47-year-old woman received a blood transfusion because of anemia 1 month after nephrectomy. She sustained a hemolytic reaction, with shutdown of her remaining kidneys. She remained oliguric until 26 days later, when, after 11 dialyses, she died in an abrupt and unexpected episode of ventricular tachycardia.

CASE 9. Hypotension with evidence of hemolysis developed in a 35-year-old woman 16 hours after transfusion of 2 units of incompatible blood. Hypotension, icterus, and cyanosis persisted for 5 days, oliguria for 31 days. Dialysis was performed 10 times.

CASE 10. A 37-year-old man suffered multiple fractures in a severe crushing injury to both lower extremities. Oliguria persisted during the final 11 days of his life, during which he received 8 dialyses with uniformly successful regional heparinization. The clinical course was relentlessly downhill, however, and terminally the patient was comatose. Autopsy revealed fat embolism of brain and lungs, multiple pulmonary emboli, and extensive cerebral hemorrhage and necrosis.

CASE 11. Oliguria persisted for 27 days in a 27-year-old man who sustained injuries from a shotgun blast at close range. Reparative surgery included

splenectomy, left nephrectomy, amputation of tail of the pancreas, 60 percent gastrectomy, removal of the splenic flexure of the colon, and repair of a tear in the liver and vascular injuries. Cardiac arrest occurred at operation, and transfusion of 37 pints of blood was required. Nonprotein nitrogen returned to normal 49 days later. Dialysis was performed 12 times, with regional heparinization because of the fresh wounds.

CASE 12. A 25-year-old male sustained multiple arm and leg fractures in an automobile accident. Admitted to the hospital 5 days after the injury, he received 2 dialyses before dying abruptly on the seventh day after onset, apparently of aspiration of gastric contents. Autopsy findings included thrombosis of left renal artery and vein, total infarction of the left kidney, multiple infarcts of the right kidney, infarcts and lacerations of the liver and spleen, and bilateral focal adrenal cortical necrosis.

Certain chemical data on these patients are summarized in table 2.

DISCUSSION

Prophylactic vs. therapeutic dialysis. All but 3 of these patients survived. As shown in table 2, the moderate elevation of the average nonprotein nitrogen and potassium concentrations illustrates the effective control of chemical deviation that was achieved, even with

Table 2. ***Clinical and biochemical data on patients treated with prophylactic hemodialysis***

Patient	*Age (years)*	*Sex*	*Cause of renal failure*	*Interval between onset and admission (days)*	*Admission*		*Average***		*Duration of oliguria (days)*	*Number of dialyses*
					*NPN**	*K+*	*NPN**	*K+*		
1	19	M	heat stroke	3	114	6.0	145	5.0	12	6
2	25	F	postoperative hemorrhage	4	132	4.8	163	5.5	12	7
3	23	M	traumatic rupture of spleen; splenectomy	4	128	4.3	120	4.6	10	5
4	23	M	stab wound; thoracotomy	6	168	6.8	131	5.9	13	7
5	30	M	ingestion of poison	3	61	5.0	120	5.6	22	16
6	30	F	abortion	5	151	5.3	117	5.7	20	10
7	21	M	trauma	3	87	6.3	130	5.2	23	18
8	47	F	transfusion hemolysis	3	86	6.0	85	3.9	26++	11
9	35	F	transfusion hemolysis	2	106	5.3	114	5.3	31	10
10	37	M	trauma	3	130	6.4	133	5.2	11++	8
11	27	M	trauma; reparative surgery	4	182	5.3	130	5.3	27	12
12	25	M	trauma	5	168	7.2	164	6.1	7++	2

*Plasma nonprotein nitrogen in mg per 100 ml.
+Plasma potassium in mEq per liter.
**During period of oliguria, average of daily values.
++Died.

the prolonged oliguria experienced by patients 5, 6, 7, 8, 9, and 11. Despite a variety of occasional complications, including persistent marked anemia in some, the clinical course of all but patient 10 was one of improvement. Appetites were good or improved progressively. No dietary restriction was imposed either with regard to quantity or composition. Thirst was moderate to absent despite the limitation on fluid intake. Even the latter could be liberalized in view of ultrafiltration during dialysis. Attempts at ambulation were usually successful between dialysis procedures, particularly later in the clinical course, and were well tolerated in patients without lower extremity injuries. All of this stands in impressive contrast to our previous experience with patients in acute renal failure, especially following trauma: With conventional treatment in the past, including hemodialysis on conventional indications, the clinical course was gradually or abruptly downhill, and uremic symptoms recurred repeatedly, particularly when dialysis was delayed or omitted in expectation of an impending diuresis.

The contrast afforded by our experience is not nearly so evident when these patients are compared with those whose acute renal failure follows nephrotoxic poisoning or hemolytic reactions to relatively small quantities of incompatible blood. Such patients characteristically demonstrate slow rates of nitrogen accumulation and relative, but usually incomplete, freedom from uremic symptoms. Although duration of oliguria may often be brief in such patients, or if it is prolonged, their clinical course may be mild, such judgment is retrospective. Predictions are hazardous, occasional instances of severe—and lethal—sepsis having occurred in our experience, for example, in patients who "should have had" a mild course. The experience reported here does not prove that prophylactic dialysis would have averted these unexpected catastrophes, but such a possibility is not ruled out. In any event, it seems unwarranted to subject patients to several days of avoidable nausea, vomiting, and drowsiness, even if their survival does not appear to be directly threatened.

Logic of prophylactic daily hemodialysis. Fundamentally, all acute renal failure must be considered reversible despite 2 or 3 weeks of severe oliguria. Although an occasional patient will die of an unresolved surgical situation and other patients, especially in the older age groups, may die of unexpected and unexplained causes (such as patient 8), it is fair to assume that much of the mortality from acute renal failure may be attributed to the severe morbidity of the uremic syndrome. Malnutrition and wasting appear to be the principal late findings, together with sepsis due to common nonpathogenic organisms. Although the biochemical details of this obvious interference with

normal cellular function in multiple tissues have not as yet been spelled out, even the transient improvement of most patients following conventional dialysis strongly suggests, at least, that one or more intoxicants are being removed.

Hemodialysis is preferred over other methods of extrarenal excretion because of its efficiency. Although peritoneal dialysis may also be used prophylactically,[7] there is a risk of peritonitis; and certain patients, especially those with abdominal injuries, should probably not be treated by this technic.

Hemodialysis is best used prophylactically because a clinically healthy patient may be carried through an episode of acute renal failure with far less risk, we believe, than one who is clinically ill. The results reported above amply demonstrate that such clinical health can be achieved and maintained in patients who are treated at a renal center and whose underlying injuries or concurrent diseases are compatible with survival and are not complicated by severe sepsis.[8] Furthermore, the alternatives to the prophylactic use of dialysis are to apply it on conventional indications or not use it at all; the high rates of morbidity and mortality that follow these alternatives, especially among injured patients, are already well known. Certainly *no improvement in that state of affairs may be anticipated from the mere continuance of such conventional methods of therapy.*

If dialysis is performed often enough to prevent clinical uremia and pronounced chemical abnormalities, it may not be required daily. However, following wounds, accidental trauma, or extensive surgical procedures, the accelerated catabolic rate[1,2] may result in such a rapid daily accumulation of metabolites that daily dialysis may indeed be required.

Accordingly, we have identified the indications for the use of prophylactic dialysis in acute renal failure to be the existence of established oliguria for 48 hours or more in a fully resuscitated patient with patent renal vascular supply and patent postrenal urinary tract, whose nonprotein nitrogen has not exceeded 150 mg per 100 ml. This arbitrary nonprotein nitrogen level is subject to revision; 50 or 100 mg per 100 ml may be preferable in the final analysis. The point of emphasis is that levels above 150 mg per 100 ml imply late referral, beginning clinical uremia, and the setting that has led to fatality so often in the past. With regional heparinization there are no known contraindications to prophylactic dialysis.

Logic of renal centers. Prevention of the uremic syndrome and constant control of its chemical deviations require the full-time services of an expert staff. It is this latter capability that defines the term "renal center"—a term that is seen to imply much more than

merely a room containing an artificial kidney. Concentrating patients at such a center justifies the cost of the equipment and of maintaining an adequate staff and promotes adequate staff training and a state of readiness.

The experience described in this report clearly supports the injunction [9] that these patients should be transferred to a center capable of hemodialysis *as soon as the diagnosis is made.* A revision specifying prophylactic dialysis may also be indicated if our future experience parallels that reported here. In the military services, active duty members and their dependents may be transported for prophylactic dialysis to renal centers located at this medical center and at the Department of Metabolism, Walter Reed Army Institute of Research, Washington, D.C. Such transfer is authorized by direct communication between hospital commanders.[10] Pertinent considerations for the safe transportation of these patients are as follows:

1. *Correct diagnosis of acute renal failure:*
   a. Established oliguria—400 ml per 24 hours or less, in the presence of clinically adequate hydration.
   b. Patent urinary tract and renal vascular supply.
   c. Full resuscitation without vasopressors.
   d. Terminal chronic renal insufficiency reasonably excluded.
2. *Telephone communication as soon as diagnosis is made,* between patient's physician and renal center staff for details of management and evacuation, with referring physician's concurrence:
   Walter Reed Army Medical Center, Department of Metabolism, Washington, D.C., RAndolph 3-1000, Ext. 3529.
   Brooke Army Medical Center, Renal Branch, U.S. Army Surgical Research Unit, San Antonio, Texas, CApital 2-8411, Ext. 4307.
3. *Air evacuation* usually via MATS on the 3d to 5th day after onset.
   Safeguards:
   a. Blood pressure stable without vasopressors.
   b. Nasogastric tube in place, with suction applied by bulb syringe if necessary.
   c. In presence of potassium intoxication, intravenous infusion of special solution as directed by renal center staff. (See also TB Med 252.[9])
   d. Ordinarily physicians will not need to attend patient during flight.

Experience with even severely wounded military casualties in Korea [1,2] amply demonstrated that the vast majority of these patients are transportable within the first 3 or 4 days following onset. In view of the currently high morbidity and mortality rates among conventionally treated patients (as in table 1), it should be clearly recognized that the decision *not* to refer a patient with acute renal failure to a renal center will incur for that patient a high risk of mortality. The trends in the data presented here strongly suggest that such a risk may be almost entirely avoidable.

Application to military medicine. Without entering into debate concerning the possible handling of patients with acute renal failure in future wars, we believe that, with adequate preparation, optimal treatment may be afforded such patients even under combat conditions. They may be expected in greater numbers in a more mobile combat situation than was the case in Korea, even if the killed-in-action rate is also somewhat higher. Longer delays in evacuation and resuscitation may be the principal cause of such an increased incidence. In any event, given adequate *prior* clinical experience with these patients concentrated at centers established not only to treat but to study them, treatment systems might well be evolved during this present period of peacetime that could salvage wartime patients for further active duty or for other support of a war effort.

SUMMARY AND CONCLUSIONS

A procedure for the routine performance of prophylactic daily hemodialysis in cases of acute renal failure is described. A series of 12 cases is presented in which prophylactic daily dialysis was generally associated with effective control of biochemical abnormalities and progressive clinical improvement, even in patients with prolonged oliguria. This experience provides a marked contrast with the usual course observed when such patients receive hemodialysis on conventional indications. The indications for prophylactic dialysis are outlined, and the rationale of renal centers is discussed.

Prophylactic daily hemodialysis is technically feasible. Morbidity in patients so treated is strikingly reduced in contrast with past experience. The recurrent clinical crises that in the past were so common with conventional management are virtually absent. It is anticipated that the clinical improvement during oliguria characteristic of the cases reported here will continue to occur as additional patients receive prophylactic dialysis at a renal center. It is anticipated, too, that as morbidity is lessened, a commensurate reduction in the mortality of patients with acute renal failure may also occur.

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CALAMUS SCRIPTORIUS

Few physicians who contribute regularly to medical journals or who profess an inborn flair for composition, even though their contributions rarely reach the printer's ink and paper stage, are perfectionists in composition. A perfectionist by my definition is one so gifted in the art of writing and so wise on the subject selected that the first copy is clean, tells the story as the writer desires the story to be told, and, except for the checking of references and the preparation of figures or tables, is ready for editorial decision. There are a few contributors to American medical periodicals who have demonstrated their ability to make the first draft the final draft. Paul D. White, cardiologist to the President, a cyclist for his own pleasure, and a friend of the multitudes, is a writer capable of performing in near-perfect fashion. There are a favored few so endowed with talent of composition and selection of words that the copy is faultless by the second or third revision. The majority of us, however, must struggle through revision after revision, draft after draft, to achieve the goal. The final product should be pleasing to the ear as well as to the eye. The statements should be factual and the manuscript only long enough to cover the subject without repetition.—JOHN H. TALBOTT: The Elements of Style (editorial). *The Journal of the American Medical Association*, January 23, 1960.

Griseofulvin Therapy in Chronic Dermatophyte Infections

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WIDESPREAD INTEREST followed Gentles' disclosure [1] that guinea pigs experimentally infected with trichophyton and microsporum organisms were successfully treated with orally administered griseofulvin, and Blank and Roth's revelation at the 1958 meeting of the American Academy of Dermatology and Syphilology that griseofulvin was effective in the treatment of human beings infected with *Microsporum*, *Trichophyton*, and *Epidermophyton* species. Subsequently, reports proclaiming the effectiveness of this revolutionary antifungal antibiotic have been appearing in the literature [2-5] at a rapid rate. There have been no significant adverse reports regarding its use.

Released by the Food and Drug Administration in this country on 17 July 1959, griseofulvin is available commercially in 250-mg and 500-mg tablets. The initial patients treated at this hospital with the drug, after its release by the Food and Drug Administration, were included in a carefully controlled study in order to determine any possible adverse effects.

MATERIAL AND METHODS

A total of 37 patients with 6 different clinical types of infection (table 1) were included in the study. Patients who presented clinical evidence of chronic infection with organisms of the genera microsporum, trichophyton, or epidermophyton, and in whom the clinical diagnosis was supported by at least 1 positive potassium hydroxide preparation, were selected as subjects. All patients included in the study were carefully screened for concurrent disease by examination, complete blood cell count, and urinalysis prior to initiation of therapy. Cultures were planted from all infected sites before therapy. Repeat

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complete blood cell counts, urinalyses, potassium hydroxide preparations, and cultures were performed at intervals of 1 or 2 weeks throughout the study. Only 2 dosage schedules were used, as determined by the following conditions: (1) Griseofulvin, 250 mg 2 times a day, was administered to all patients 12 years of age or younger, all patients with tinea capitis, and all patients with onychomycosis without other involvement. (2) Griseofulvin, 250 mg 4 times a day was administered to all patients, over 12 years of age, with infections other than tinea capitis or onychomycosis.

RESULTS

Since many patients had more than 1 clinical type of infection, the results are analyzed by type of infection rather than by individual patients.

Table 1. ***Types of infection in 37 patients***

Infection	*Number of patients*
Tinea capitis	14
Tinea cruris	6
Tinea corporis	6
Tinea pedis	15
Tinea manuum	3
Onychomycosis	14
Total	58

Tinea Capitis

It was in this group of patients that griseofulvin therapy appeared most dramatic. In 13 of the 14 patients with tinea capitis, *Microsporum audouini* was identified in cultures. Cultures from the remaining patient failed to grow on Sabouraud's agar; however, by clinical and epidemiologic impression, supported by potassium hydroxide preparation and fluorescence under the Wood's lamp, it was held probable that this case was also due to *M. audouini*. The duration of infection in this group of patients before initiation of griseofulvin varied from 2 weeks to 3 years. Clinical improvement was first noted after 1 to 4 weeks of therapy, the average being 2.4 weeks. In 13 patients complete clinical and mycologic cure was observed after 3

to 9 weeks of treatment, the average length of treatment being 5 weeks. The remaining patient, who has had tinea capitis for 3 years, has been under treatment for 3 weeks and still has several fluorescent hairs. He has shown definite clinical improvement since the second week of treatment.

The only associated treatment permitted in this group of patients was clipping of the hairs in the area of involvement. Two of these patients were observed 6 weeks following cessation of therapy and had no evidence of recurrence or reinfection on clinical examination and examination under the Wood's lamp.

Tinea Corporis and Tinea Cruris

The cases of tinea corporis (6 cases) and tinea cruris (6 cases) will be considered together inasmuch as the nature of infection and response to treatment were similar. Incriminated by culture as the cause of these 2 clinical types of infection were *Trichophyton rubrum* (in 4 patients) and *Epidermophyton floccosum* (in 1 patient). Cultures from the remaining 7 patients failed to grow any dermatophyte, although all cases were typical chronic infections with positive potassium hydroxide preparations. Of these 12 patients, 10 were considered cured by clinical and mycologic criteria after 2 to 4 weeks. The average length of treatment for these 10 was 2.9 weeks. Clinical improvement was first observed in these patients after 1 to 3 weeks, the average being 1.6 weeks. Of the remaining 2 patients, 1 failed to return after the initial visit, and the other, who has an infection with *T. rubrum* of 8 years' duration, still has positive scrapings on potassium hydroxide preparations after 11 weeks of therapy although he shows no clinical evidence of disease.

Tinea Pedis and Tinea Manuum

The 15 cases of tinea pedis and 3 cases of tinea manuum will also be considered together since they were morphologically similar and no acute infections were included in the study. Of the 18 cases studied, 9 were proved by culture to be due to *T. rubrum* and 3 to *E. floccosum*. In the remaining 6 cases, organisms failed to grow on culture, although by clinical criteria and by potassium hydroxide preparations the infections were typical. In 4 cases of tinea pedis due to *T. rubrum* and 1 due to *E. floccosum*, the patients were cured by clinical and mycologic criteria. One patient with tinea manuum due to *E. floccosum* was also considered cured. These 6 were treated for 4 to 7 weeks before clinical cure was observed. Of the remaining patients,

10 have been under treatment from 2 to 11 weeks and still have clinical or mycologic evidence of continued infection. One patient who had involvement of both his palms and soles failed to return after the second visit although there was clinical evidence of improvement at that time.

Onychomycosis

It is with this clinical type of infection that our results have been least encouraging. Of the 14 cases of nail involvement, 5 were proved by culture to be due to *T. rubrum*, 2 were due to *E. floccosum*, and 1 was due to *Trichophyton mentagrophytes*. The remaining 6 failed to grow on culture although they were typical infections by clinical criteria and by potassium hydroxide preparations. In 1 patient only the fingernails were involved, in 7 patients only the toenails, and in 6 patients both fingernails and toenails were involved. None of these patients have been cured by clinical or mycologic criteria after 2 to 12 weeks of therapy; however, all but 4 have shown evidence of normal nail appearing proximally. The 4 who have shown no clinical improvement have all been under treatment for less than 4 weeks.

It is interesting that this series included 2 cases of onychomycosis due to *E. floccosum*, an organism not usually found in nail infections. One of these patients has had psoriasis for several years; we may speculate that the altered keratin due to psoriasis may have provided a more suitable substrate for this organism. The other patient had no evidence of psoriasis but did have associated tinea pedis and tinea manuum, also due to *E. floccosum* involving the skin in contiguity with the nails.

COMPLICATIONS AND DISCUSSION

No serious complications or adverse reactions to griseofulvin were observed in this study. One patient complained of malaise, generalized myalgia, nausea, vomiting, and diarrhea within 3 days following initiation of therapy. His symptoms subsided within 48 hours without withdrawal of griseofulvin. It was believed that these symptoms were due to a concurrent viremia and not to griseofulvin therapy.

One other patient, not included in our study but observed by us, developed a generalized eczematous eruption involving his feet, hands, and lateral nuchal and antecubital areas after receiving griseofulvin for 2 weeks for treatment of tinea pedis with an associated eczematous eruption on the dorsa of his feet. Griseofulvin was discontinued and he was treated with a short course of systemically administered

steroids, with prompt clearing of the generalized eruption. It was suspected that the mechanism in this patient was an autosensitization reaction, triggered by the eczematous eruption on his feet at the time griseofulvin was started, and that the griseofulvin therapy was coincidental to the generalized eruption. Further testing with griseofulvin to substantiate this suspicion has not been done and the patient has not received the drug again.

One of the patients included in our series, with onychomycosis of 15 years' duration, had diabetes mellitus. No change in blood sugar levels, renal threshold, or insulin requirement has been observed during the 8 weeks he has been on griseofulvin, 250 mg 2 times daily.

The patient with onychomycosis due to *E. floccosum* and concurrent psoriasis has observed gradual improvement in his psoriasis during the 9 weeks he has been taking griseofulvin. Scrapings from the psoriatic plaques have been repeatedly negative for fungi. Although the significance of these changes is not clear, it is unlikely that his improvement is directly related to griseofulvin. Before he was included in this study, the patient had attributed his nail changes to psoriasis; and it may be that the psychic effect of improvement in his dystrophic nails had a favorable influence upon the psoriasis.

Our observations have led us to conclude that the most promising use for griseofulvin in chronic infections due to dermatophytes is in the treatment of tinea capitis, many cases of which previously required x-ray epilation to achieve a cure. In most cases of tinea corporis and tinea cruris of many years' duration, clinical and mycologic cure may be achieved in a matter of several weeks. A few of these patients, however, obtain clinical cure without mycologic cure on the dosage schedules used in this study. The treatment of chronic tinea pedis, tinea manuum, and onychomycosis with griseofulvin has been less encouraging in that the length of time required to achieve a clinical and mycologic cure is more prolonged. Optimal dosage schedules for treatment of chronic infections due to dermatophytes remain to be established. It may well be that griseofulvin need not be continued until mycologic cure has been achieved, but that the deposition of the drug in the epidermis will provide a barrier against reinfection so that shorter dosage schedules may be used.

SUMMARY

Our experience with griseofulvin, a new orally administered, effective antifungal antibiotic, in the treatment of 37 patients with chronic infections due to the dermatophytes has been presented. The infections have been analyzed with regard to clinical types rather than

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individual patients. Griseofulvin has appeared most promising in the treatment of tinea capitis and least promising in the treatment of onychomycosis.

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EXERCISE IN ARTERIAL DISEASE

Diseases of the arteries throughout the body now hold first place in mortality and probably also in morbidity. Not only has the heart suffered severely from atherosclerosis of the coronary arteries but the brain too is crippled by extensive atherosclerosis of the arteries supplying blood to the brain, the kidneys are damaged by reduction of their arterial blood supply [which incidentally can be an important cause of hypertension], and the circulation in the legs is becoming increasingly hampered by atherosclerotic changes in the lower aorta and its main branches—the iliac arteries. It has been said by some that arterial disease is increased by exercise but almost all the evidence points the other way.—Paul D. White: The Advantages of Physical Fitness. *The Illinois Medical Journal*, October 1959.

Did you enter the June Poll of Readers?
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Immunity to Diphtheria in U.S. Soldiers

LIEUTENANT COLONEL JOSEPH W. COOCH, MC, USA
MAJOR JEROME H. GREENBERG, MC, USA

TETANUS AND DIPHTHERIA TOXOIDS, combined for adult use, became a standard military medical supply item in 1954, replacing tetanus toxoid for routine immunization. The combined agent contains 2 Lf doses of diphtheria toxoid per ml, roughly one-tenth the standard pediatric dose. By late 1955 it had generally replaced the monovalent preparation. At the same time, Schick testing of military personnel under 35 years of age and administration of diphtheria toxoid to those persons having positive reactions were discontinued.

Inasmuch as reimmunization with either tetanus toxoid or the combined preparation is required every 4 years, nearly every person on active duty has received at least 1 dose of the combined vaccine and, consequently, a booster to his diphtheria antibody level. To determine the extent of diphtheria immunity (as measured by the Schick test) in Army personnel, men from 2 engineer construction battalions were selected for study. Despite the small sample, results of the study are believed to be representative of the Army as a whole.

METHODS AND MATERIALS

A total of 404 men, all of whom had completed basic training, were tested, 182 from the first battalion and 222 from the second.

The Schick test toxin, prepared on 29 August 1958, was a dilution of diphtheria toxin concentrate No. 10, which undiluted contains 2,250 Lf doses per ml purified to 1,770 Lf doses per mg N. Of a 1:100 dilution, 7.2 ml was added to the diluent described later to make a total volume of 9,000 ml. The final toxin then contains 0.018

From Communicable Disease Branch, Preventive Medicine Division, Office of The Surgeon General, Department of the Army, Washington, D.C.

Lf dose per ml or approximately 0.4 MLD per ml. It was Berkefeld filtered on the day of preparation.

The control toxin, prepared on 15 September 1958, was a dilution of diphtheria toxoid PT 28, which undiluted contains 1,200 Lf doses per ml, purified to contain 1,980 Lf doses per mg N. To the diluent described in the following paragraph 0.6 ml was added to make a total volume of 9,000 ml, so that the final product contains 0.08 Lf dose per ml. It was Berkefeld filtered on the day of preparation.

Each 9,000 ml of both toxin and control contained 90 ml of 1:100 Merthiolate (thimerosal) and 144 ml of human albumin and was made up in borax-buffered solution. The preparations had been subjected to appropriate safety and toxicity tests and had an expiration date of November 1960.

Each man received 0.1 ml of the toxin in one forearm and 0.1 ml of the control material in the other arm. Tests were read 48 hours later. An area of redness 10 mm or more in diameter was interpreted as positive if the control arm showed no reaction; a reaction whose diameter exceeded the control by more than 10 mm was also considered positive. Although these standards were established before the study was under way, in no instance was there doubt whether a test was positive or negative.

The men in one battalion were tested on 8 September and those in the other on 15 September. On 9 December an attempt was made to retest all those whose reactions had been positive during the first test. Although some of the men were no longer assigned to these units and a few were not available because of leave, temporary assignment elsewhere, or other reasons, it was possible to retest 25 of the 34. Tests were again read 48 hours later, using the same criteria.

Although records of all previous immunizations were not complete, note was made of the latest booster dose of tetanus toxoid recorded on the immunization register of each soldier and the region from which he had entered military service.

RESULTS

The initial Schick test was positive in 8.2 percent of one battalion and 8.6 percent of the other battalion, giving an over-all percentage of 8.4 (table 1). Although in individual companies there was a range of from 2.0 to 16.7 percent, the differences were not considered significant.

Of the 34 men who were positive, 7 (21%) had no record of booster doses of tetanus toxoid since 1955 or earlier, whereas only 14 (3.8%) of the 370 who were negative had not been immunized since 1955.

Table 1. *Results of initial Schick tests*

Battalion	Positive		Negative		Total
	Number	Percent	Number	Percent	
First	15	8.2	167	91.8	182
Second	19	8.6	203	91.4	222
Total	34	8.4	370	91.6	404

For retesting, 25 of the 34 men who had been positive were available. Of these, 8 (32%) were positive and 17 (68%) were negative. Thus, 32 percent of 8.4 percent, or about 3 percent, had an immune status so low that the amount of toxoid in a single Schick test had not been enough to convert them from Schick positive to Schick negative. These men had not received any diphtheria or tetanus-diphtheria toxoid in the meantime.

Within the retested group, disregarding the 9 unknowns, 3 (37.5%) of the 8 positives had not had a dose of tetanus toxoid since 1955 whereas only 1 (6%) of the 17 negatives had not had tetanus toxoid within that time.

DISCUSSION

These results indicate that the device of including a small dose of diphtheria toxoid with each dose of tetanus toxoid affords an effective means of keeping the general level of diphtheria immunity high enough so that nearly everyone has an adequate degree of protection. At the same time, the amount of diphtheria toxoid present is not sufficient to make any great difference in the number of reactions to the tetanus toxoid.[1]

Although it is not possible to say that the small sample tested is a complete cross section of the Army, the proportion by grade structure, varying from privates to captains, was that of other units except for the absence of basic trainees. Personnel were from all regions of the United States, plus Puerto Rico, the Philippines, and Europe. As is true of the Army in general and of the population of the United States as a whole, the highest percentages were from the Middle Atlantic, East North Central, and South Atlantic regions.

We believe that this study demonstrates the practical efficiency of this immunologic technic in greatly reducing the number of injections that must be administered or received. To our knowledge, the only comparable study in seasoned troops as opposed to recruits was performed in 1944, when a United States Army survey [2] showed that of troops who had completed their basic and unit training, 55.6

percent were Schick negative. These workers were unable to repeat their tests. In 1950, using a somewhat different basis for interpreting the test results, Pappenheimer and associates [3] found 40.3 percent of military personnel to be Schick positive. We have not found any recent report of the Schick status of civilian adults in the United States.

SUMMARY

Of 404 soldiers, all of whom had completed basic training, 34 (8.4%) were Schick positive. Of the 25 positives available for retesting 3 months later, only 8 were still positive, although no immunization had been performed in the interim. These results are believed to demonstrate the practical efficiency of the military immunization program against diphtheria. Schick sensitivity appeared to have some association with nonperformance of reimmunization during the preceding 4 years.

ACKNOWLEDGMENT: The authors wish to thank Dr. Johannes Ipsen, Superintendent of the Institute of Laboratories, for a description of the materials, furnished through the generosity of the Biologic Laboratories of the Department of Health of the State of Massachusetts, used in this study; and Drs. Geoffrey Edsall and Ross L. Gauld, Walter Reed Army Institute of Research, Washington, D.C., for advice in the procedure of the study. Arrangements for the study were made through the courtesy of Colonel Angel Cardona, Surgeon, Military District of Washington, and Colonel J. T. B. Strode, Commanding Officer, DeWitt Army Hospital, Fort Belvoir, Virginia.

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Restorative Dentistry Workload of U.S. Air Force Dental Service

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MAJOR CLARENCE M. MC CALL, JR., USAF, DC

A CRITICAL EVALUATION and documentation of the need for various types of dental manpower in the Armed Forces would form a significant contribution to U.S. dentistry and to the active military establishment.[1] Determination of the dental treatment requirements of the Armed Forces is essential for optimum utilization of available dental resources.

A number of studies of the need for dental treatment in Army and Navy recruits have been conducted recently. Hobson [2] found that 19 percent of Army recruits needed dentures, 25 percent needed fixed bridges, and 45 percent needed prophylaxis. Hellman and his associates [3] reported that 90.3 percent of naval recruits required fillings and 31 percent needed extractions. Rovelstad and associates [4] noted that only 20.8 percent of naval recruits were free of gingivitis and concluded that the dental health of young men reporting for military duty is deplorable.

The investigation reported here was performed to develop a method for estimating the U.S. Air Force restorative dentistry workload for enlisted personnel at base and command levels, and to analyze the present restorative dentistry workload for the U.S. Air Force Dental Service.

METHOD

During 1958 dental examinations were conducted on 26,369 incoming enlisted personnel at 48 Air Force bases. The geographic distribution of the sample is shown in figure 1.

From U.S. Air Force School of Aviation Medicine, USAF Aerospace Medical Center, Brooks Air Force Base, Texas. Report No. 60-27.

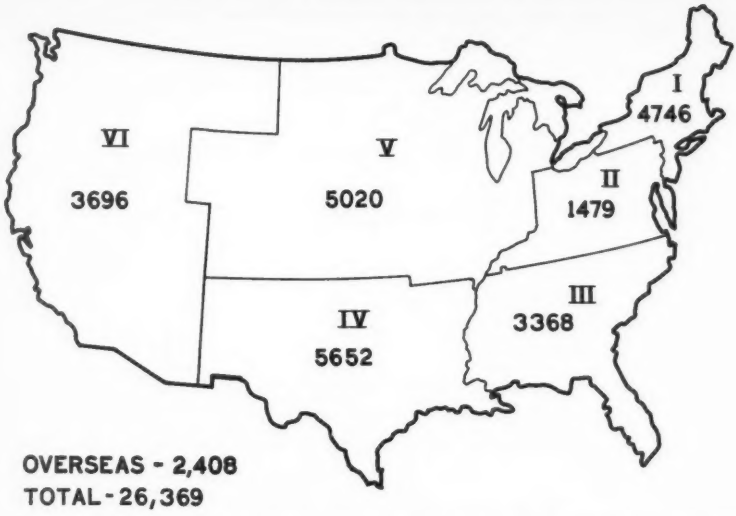

Figure 1. Geographic distribution of sample of 26,369 incoming enlisted personnel at 48 Air Force bases on whom dental examinations were performed in 1958.

The standard type 2 dental examination was performed by the dental examining officer on all incoming enlisted personnel. Data collection was limited to the need for restorative dentistry and no attempt was made to study periodontal, prosthetic, or oral surgery problems. The restorative workload was determined by counting

Table 1. *Mean number of restorations required for incoming enlisted personnel*

Grade	*Average age*	*Average number of restorations required*
A/B	18. 9	6. 77
A/3C	19. 8	6. 30
A/2C	21. 5	4. 45
A/1C	24. 5	3. 46
S/Sgt	28. 4	2. 75
T/Sgt	33. 0	2. 17
M/Sgt	38. 5	1. 62

individual cavities and defective restorations. Edentulous patients were included as they appeared and were scored zero. Teeth marked for extraction were not considered in this study. The age and grade of each subject were recorded.

FINDINGS AND DISCUSSION

The mean number of restorations required for incoming enlisted personnel at each grade was determined (table 1).

The number of restorations presently required at base, command, or Air Force level was estimated by multiplying the mean number of restorations required for incoming personnel by the number of personnel within each grade (table 2). It was estimated that a total of 2,810,448 restorations would be required by the 724,956 U.S. Air Force enlisted personnel, or an average of 3.88 restorations per enlisted man.

Table 2. ***Estimate of total restorations required according to grade of enlisted personnel***

Grade	*Number of Air Force* personnel*	*Estimated number of restorations required*
A/B	26, 798	181, 422
A/3C	110, 101	693, 636
A/2C	200, 846	893, 765
A/1C	113, 661	393, 267
S/Sgt	146, 864	403, 876
T/Sgt	71, 364	154, 860
M/Sgt	55, 322	89, 622
Total	724, 956	2, 810, 448

*Data from surgeon general, U.S. Air Force

The total number of restorations performed during 1958 was compared with the estimated present operative workload for enlisted personnel in the major Air Force commands (table 3). A total of 1,762,680 restorations were performed in 1958, as compared with the estimated total workload of 2,810,448 restorations. The mean number of restorations required by enlisted personnel within the major commands was also determined (table 4).

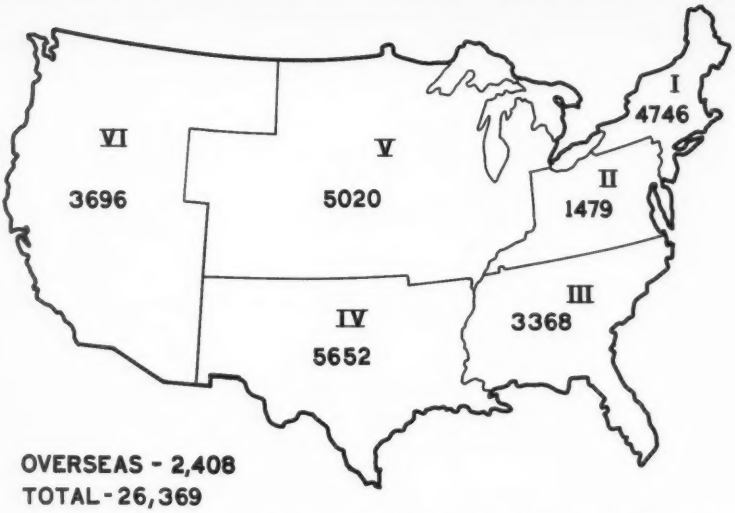

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Table 3. ***Comparison of actual and estimated workloads in major commands***

Major commands	*Total restorations accomplished (1958)**	*Estimated present restorative workload*
SAC	490, 428	743, 531
ADC	185, 322	367, 067
MATS	119, 454	340, 620
ATC	270, 566	312, 785
USAFE	150, 706	225, 676
TAC	147, 049	174, 434
PACAF	138, 331	165, 321
Pipeline	0	134, 982
USAF SEC	0	73, 582
AMC	72, 290	64, 843
ARDC	50, 828	55, 835
Hq C	39, 228	49, 490
Alaskan AC	38, 899	44, 655
CONAC	31, 256	35, 507
AU	21, 253	14, 256
AF ACAD	3, 008	4, 566
Carib AC	4, 062	3, 288
AF FIN DIV	0	10
Total	1, 762, 680	2, 810, 448

*Data from surgeon general, U.S. Air Force.

Table 4. ***Mean number of restorations required by enlisted personnel according to major commands***

Major commands	*Average number of restorations required*	*Major commands*	*Average number of restorations required*
ATC	4. 29	TAC	3. 70
PACAF	4. 01	AMC;	3. 51
AAC	3. 99	ARDC	3. 48
Security	3. 99	AF ACAD	3. 44
ADC	3. 92	CONAC	3. 37
USAFE	3. 81	AU	3. 35
MATS	3. 76	Hq C	3. 30
SAC	3. 74	Carib AC	3. 21

Table 5. ***Mean number of restorations required by sample population according to major commands***

Major commands	*Average number of restorations required*	*Major commands*	*Average number of restorations required*
ATC	5. 83	AMC	4. 38
TAC	4. 81	CONAC	4. 38
ADC	4. 66	SAC	4. 09
CAC	4. 53	MATS	3. 99

Analysis of these data reveals that within any major command there is no marked deviation from the over-all Air Force mean of 3.88 required restorations. It was also found that the mean age of all the enlisted grades was similar in the various commands and areas.

The mean number of required restorations for enlisted personnel within the major commands was also determined for the sample population of this investigation (table 5). As already mentioned, this sample population consisted solely of personnel reporting to Air Force bases during 1958. The increase over the Air Force mean of

Table 6. ***Restorative workload according to age of enlisted personnel***

Age	*Average number of restorations required*	*Percent of enlisted personnel requiring restorations*
17	7. 44	92. 5
18	7. 07	90. 9
19	6. 25	87. 2
20	5. 28	82. 1
21	4. 62	79. 4
22	4. 42	79. 7
23	4. 07	77. 0
24	3. 55	74. 0
25	3. 39	75. 5
26–27	3. 20	72. 3
28–29	2. 63	67. 3
30–32	2. 38	67. 9
33–35	2. 04	63. 2
36–39	1. 81	58. 2
40–49	1. 50	50. 2
50–63	0. 60	31. 0

3.88 required restorations, especially for the Air Training Command, is explained by the large number of required restorations and the high annual increment of new carious lesions characteristic of the population entering the Air Force.

The mean number of restorations and the percent of enlisted personnel requiring restorative dental treatment were also calculated according to age (table 6).

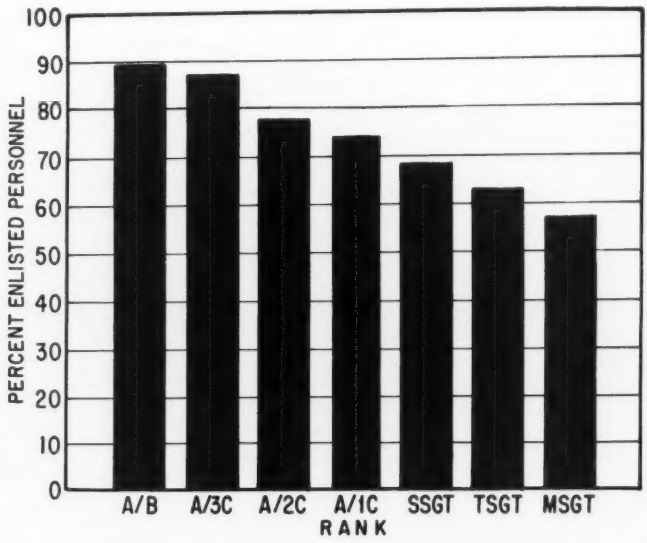

Figure 2. Restorative dentistry required by enlisted personnel according to grade.

The percentage of enlisted personnel needing restorative dentistry was also examined according to grade (fig. 2). The proportion for each grade decreased progressively from 89.7 percent for the basic airman to 56.6 percent for the master sergeant. The restorative dentistry problem for the basic airman is thus almost identical with that reported for naval recruits,[3] 90.3 percent of whom require restorations. The mean number of restorations needed was 6.16 per naval recruit as compared with 6.77 per basic airman.

The number of restorations required by Air Force enlisted personnel was compared with the number required by civilians (fig. 3). The curve for military restorative dentistry drops appreciably below the mean civilian estimate in the 25- to 30-year age group. Among

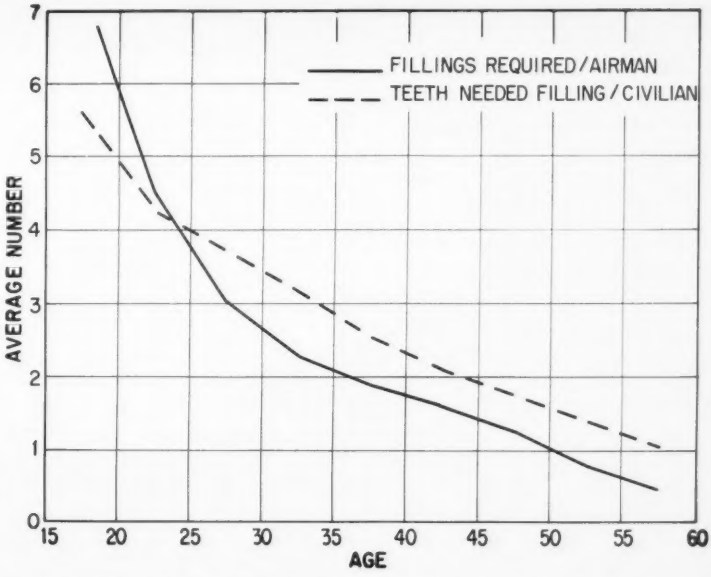

Figure 3. Comparison of number of restorations required by Air Force enlisted personnel and by civilians. Data from Moen.[5]

Air Force personnel, promotion to noncommissioned officer grade normally occurs during this period. These data suggest that the Air Force dental program has little effect in reducing the mean number of restorations required for airmen in the lower grades; among noncommissioned officers, however, reduction is evident.

The number of restorations required by enlisted personnel is only part of the annual restorative workload imposed on the U.S. Air Force Dental Service. To the estimated 2,810,448 restorations required by enlisted personnel must be added those needed by officer personnel (table 7).

The number of restorations required by overseas dependents and new basics and the annual increment of new carious lesions per individual are additional factors to be considered in analyzing the restorative dentistry workload. Currently, there are approximately 201,000 dependents in overseas areas. Data necessary to estimate the number of restorations required by these dependents are not available. In 1958, incoming basics needed 402,199 restorations. Insufficient data exist at the present time to permit determination of the annual increment of new carious lesions in the U.S. Air Force.

Table 7. ***Restorations required for officer personnel, according to age***

Age	*Officer personnel**	*Number of restorations required*
20–24	18, 699	85, 080
25–29	33, 634	102, 247
30–34	16, 939	38, 282
35–39	35, 410	66, 217
40–44	21, 086	33, 159
45–49	4, 949	6, 087
50 and over	2, 596	1, 557
Total	133, 313	332, 629

*Data from surgeon general, U.S. Air Force.

Data from studies being conducted at the U.S. Air Force School of Aviation Medicine to reduce this annual increment should permit an estimate of its impact on the restorative dentistry workload.

It is evident that a large discrepancy exists between the capability of the dental service and the number of restorations required by Air Force personnel. Increasing this capability would result in a reduction of dental disease and loss of teeth from caries and would constitute a major step toward improving the oral health of the United States Air Force.

RECOMMENDATIONS

1. Results of this investigation indicate that the capability of the restorative dentistry section of the U.S. Air Force Dental Service should be greatly increased.
2. Statistical studies of the workload of all sections of the U.S. Air Force Dental Service should be conducted and maintained.
3. Consideration should be given to the computation of dental manpower requirements based upon workload factors rather than flat ratios per military strength.

SUMMARY AND CONCLUSIONS

A method was developed for estimating the U.S. Air Force restorative dentistry workload for enlisted personnel at base and command levels.

The present restorative dentistry workload of the U.S. Air Force Dental Service was analyzed. It was estimated that 2,810,448 restorations are required by U.S. Air Force enlisted personnel. An additional 332,629 restorations are required by officers. The number of restorations required by incoming basics during 1958 was 402,199. In 1958, a total of 1,762,680 restorations were performed. The proportion of enlisted men needing restorative dentistry varies from 89.7 percent for the basic airman to 56.6 percent for the master sergeant. Effectiveness of the Air Force dental program in reducing the required number of restorative procedures is evident only at the noncommissioned officer level. The restorative dentistry workload is greatly increased by restorations required for overseas dependents and incoming basics and by the annual increment of new carious lesions per individual. A large discrepancy exists between the capability of the dental service and the number of restorations required by U.S. Air Force personnel.

This analysis indicates that the system of allocating dental resources on the basis of total number of personnel assigned is complicated by the turnover of personnel and by the restorative dental problems of incoming basics and overseas dependents. Recommendations for ameliorating this situation are made.

ACKNOWLEDGMENT: The authors express their appreciation for help given by the dental clinics at various bases participating in this study. Gratitude is expressed, also, for the technical assistance of S/Sgt Emily Everett Taylor and A/2C George W. Pugsley III.

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PARTIAL MEDICATION

There seems to be an idea that a drug which is tremendously effective when properly prescribed may still be a little bit effective in any case.—William H. Crosby: The Danger of Folic Acid in Multivitamin Preparations. *Military Medicine*, April 1960.

A New Night Vision Sensitivity Test

JO ANN SMITH KINNEY, PH.D.
EDWARD J. SWEENEY, PH.D.
ALMA P. RYAN

A NEW METHOD OF TESTING night vision sensitivity has been developed and standardized at this research laboratory, and the apparatus used in performing the test is now available in a compact, portable model. This article outlines the principles upon which the test is based, summarizes the data obtained with an experimental model of the apparatus, presents the results found with this new version of the apparatus, and indicates reasons for an optimistic prognosis for its use.

The test is based on sampling the subject's scotopic sensitivity at a number of retinal positions. Previous data have illustrated several basic principles of the method.[1, 2, 3] The sensitivity of the eye to dim light varies throughout the retina, being poorest at the fovea, increasing to a peak at 10° to 15° from the fovea, and then decreasing gradually to the extreme periphery. In addition, sensitivity is not uniform throughout the various quadrants, the nasal field—that is, the temporal retina—giving the most sensitive measures. Although averaging the data for a group of subjects yields the same map of retinal sensitivity, there are significant individual differences, not only in the overall levels of sensitivity, but also in the profiles obtained.[4]

In order to evaluate a person's sensitivity properly it is thus necessary to test at various locations and to give him a score compiled from these various measures.

The test also utilizes stimuli of various sizes. Previous results [1, 3] have shown that small stimuli of different sizes yield the same type of data as do small stimuli of varying brightness. Normal psychophysical functions are found when size is used as the variable; in addition, identical maps of retinal sensitivity are obtained when the stimulus variable is either size or brightness. This allows an extremely convenient measure of sensitivity, in terms of size, and also yields an internal

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From U.S. Naval Medical Research Laboratory, U.S. Naval Submarine Base, New London, Conn.

check of the validity of the subject's results.

Various methods of administering and scoring the test have been investigated. On the basis of these data, the present method of presenting 2 stimuli at a single trial and of using the total number correctly identified as the score was chosen.[4, 5]

These then are the considerations and principles on which the test is based. The shortcomings of many of the wartime tests of night vision, particularly with reference to reliability, are well known and have been adequately summarized by Berry.[6] These difficulties were such that some investigators were led to doubt that practical differences in night vision existed in the normal population (that is, among those who were not night blind).

As knowledge concerning night vision was accumulated, however, many of the reasons for the failures became apparent. These include the large effects on sensitivity of previous exposure to light, not only with reference to the immediate hours before testing, but also long-term, seasonal effects of light history. It has recently been shown, for example, that the amount of seasonal variation in sensitivity for a given person is as great as the normal variation found between persons at any given time.[7]

This increased knowledge of relevant variables, together with the proper care in controlling them, has revealed the existence of sizable, reliable differences in night vision, and should result also in the valid testing of this ability.

The first model of the test equipment, a large experimental version, was used on a sample of 108 enlisted men.[4] The results were very encouraging. Highly significant differences in sensitivity were found between subjects. The test-retest correlations were in the low .80's, when testing was done either in 1 day or on consecutive days. Various measures were made to indicate the internal validity of the test, and all gave positive results. These measures were based on the expectations that higher percentages would be scored for larger sizes of stimuli and that the previously established map of retinal sensitivity would be duplicated in the group results.[4]

The present model was then constructed, using the same principles as for the first one, but the apparatus was made considerably smaller and portable. This necessitated eliminating the large sphere that gave constant brightness at each position, but such constant brightness throughout the visual field was necessary only to test for the expected map of retinal sensitivity. The new model has been used to test another group of enlisted men in order to be certain that the positive results obtained with the experimental model would be duplicated.

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TEST EQUIPMENT AND PROCEDURES

The new version of the apparatus used in performing the U.S. Naval Medical Research Laboratory (NMRL) night vision sensitivity test is shown in figure 1, photographed from the subject's point of view. It has been placed in a black booth that shields the subject from light and provides his chin rest. The experimenter sits on the opposite side of the booth, screened from the subject; he presents the stimuli and records responses.

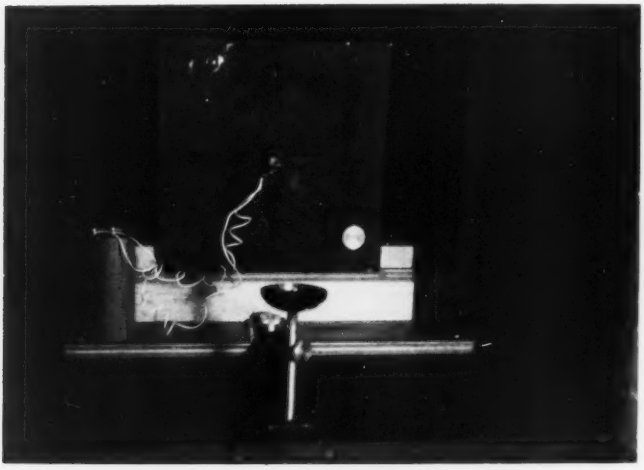

Figure 1. Portable apparatus used in performing night vision test.

The light source for the test, a miniature incandescent lamp, is surrounded by a short white cylinder and enclosed within a box 14 inches square and 3 inches deep. Both the cylinder and the front surface of the box have vertical and horizontal slits through which the stimuli shine (fig. 1). Between the cylinder and the front of the box is a large cogwheel made of sheet metal in which tiny holes of different size and position have been drilled. The knob on the front turns the cogwheel to bring consecutive sets of holes in front of the slits. In the center of the box is another miniature lamp covered by a deep red filter, which serves as a fixation point.

The source is powered by a 1½-volt battery connected to a Hunter timer to give a constant 1-second exposure. The brightness of the

white cylinder is not constant over the field since it is not a perfectly diffusing sphere. However, neutral filters and a color-compensating filter have been placed over the slits; these produce a field of approximately equal brightness of 5.5 log $\mu\mu$L and 2042°K.[3, 8]

Five sizes of stimuli are used in the test; at a viewing distance of 14.3 inches, these subtend visual angles of .090°, .124°, .156°, .186°, and .220°. Twelve positions in the visual field are tested; these are located at 6°, 12°, and 20° above, below, to the right, and to the left of the central fixation point. By the time the cogwheel has returned to its original position, each of the 5 sizes has been presented twice at each of the 12 positions.

Two spots, each in a different quadrant, are shown on each trial; in this way, the 120 stimuli are presented in 60 trials. The subject is told that he may see one or both of the spots and is instructed to report where he has seen the spots in terms of "up," "down," "right," or "left." The subject turns the knob between trials to reveal the next pair of stimuli. The entire test takes less than 15 minutes, excluding dark adaptation.

In the present evaluation of the test, 30 naval enlisted men served as subjects, 6 of whom were tested in February and the other 24 in June and July. Their ages ranged from 17 to 33.

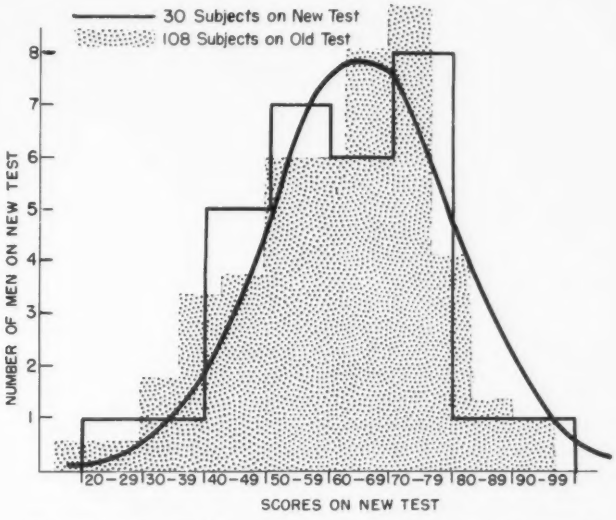

Figure 2. Distribution of test scores, in terms of the total number of correctly identified stimuli.

Testing began after 20 minutes of dark adaptation. The left eye of each subject was occluded and the right eye used throughout the test. The entire 120 stimuli were presented, a rest period was given, and then the test was repeated, in order to determine a test-retest correlation.

RESULTS

Figure 2 presents a frequency distribution of the scores, in terms of the total number of stimuli correctly identified, from the first session in which the 30 men were tested. Large individual differences are obvious since the scores range from 28 to 95 and are fairly normally distributed. The distribution for the second session was similar. The distribution of the larger group of subjects, the 108 men used in the previous study,[4] is superimposed by means of its own normal curve on the distribution in figure 2 for comparison. The 2 distributions are very similar in shape, indicating that the new method of administering the test is differentiating the men in the same manner as the old.

Table 1. ***Number of stimuli correctly identified, out of 120 presented, by 30 men, in new version of night vision test***

Factor	*No. stimuli identified*	
	First session	*Second session*
24 MEN—SUMMER		
Mean	58.5	63.7
SD	13.6	14.2
test-retest *r*	.865	
6 MEN—WINTER		
Mean	66.7	69.8
SD	17.8	19.9
test-retest *r*	.962	
TOTAL N=30		
Mean	60.1	64.9
SD	14.9	15.7
test-retest *r*	.897	

Table 1 gives the average data for the men in both sessions together with the test-retest correlations. The 30 men have been separated according to the season in which they were tested in order to compare results.

The average for the winter group is higher in both sessions than that for the summer, as would be expected from the seasonal effect. It might be anticipated that this factor would inflate the test-retest correlations of the total group if, for example, there were a few extremely high scores in the winter group. To check this, the average difference between winter and summer scores was subtracted from the scores of each of the men in the winter group and the correlation for the total group was recomputed. This procedure resulted in a correlation of .894, as compared with .897 for the uncorrected scores, so that it may be safely concluded that the high reliability of the night vision test does not depend on seasonal variations.

It may also be seen in table 1 that scores obtained in the second session were somewhat higher than those in the first. Part of the increase is undoubtedly a practice effect, also found in the previous results on the 108 men, and part a slight increase in sensitivity due

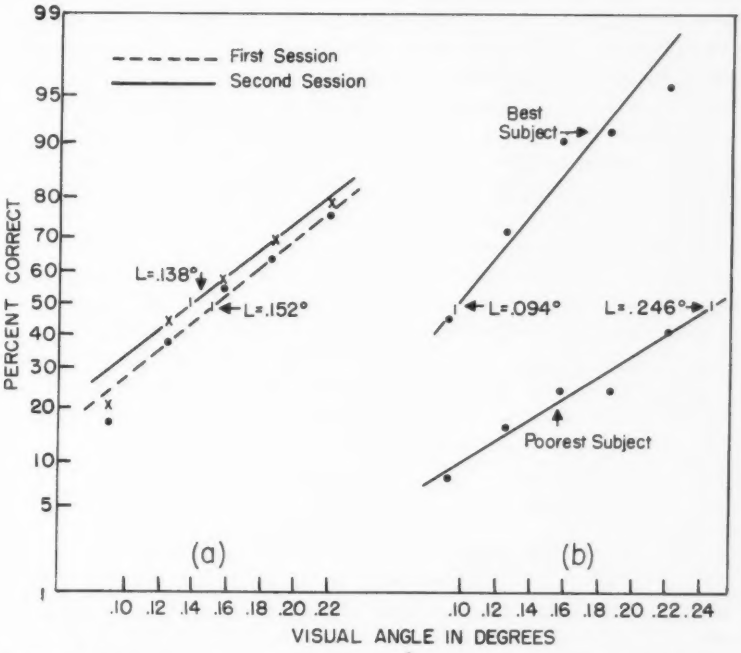

Figure 3. Frequency curves for average number of stimuli correctly seen (a) by 30 men in the first and second sessions, and (b) by the most sensitive and least sensitive subjects.

to an extra 15 minutes of dark adaptation by the time the second session was started. The latter, however, cannot affect the use of the test results as long as conditions remain the same for all subjects. In order to determine whether the time allotted to adaptation could be conserved without altering the results, a group of 24 men were tested after 10, 20, 30, and 40 minutes of dark adaptation. Correlations between the number correct at the different stages of dark adaptation were as high between 20 and 30 minutes as they were between 30 and 40, and indeed as high as the test-retest values taken after 30 minutes of adaptation for each session.

Since the test consists of stimuli of different sizes, the data for each subject can be analyzed in terms of the number correctly seen at each size. Since a man should see more of larger stimuli, this provides an internal check on the validity of the results. It also gives another means of evaluating the meaning of the individual differences.

In figure 3(a), the average number correctly seen by the 30 subjects at each size is plotted on probability paper for both the first and the second sessions. In figure 3(b), the data for the most sensitive and the least sensitive men are plotted for comparison. The close agreement between test and retest for the group can be compared with the large difference between the poorest and best subjects. To be seen 50 percent of the time, a stimulus must be more than 2½ times as large for the poorest subject as for the best subject, and more than 1½ times as large as for the average subject.

The results of the test with the portable apparatus are in complete agreement with those obtained with the larger, experimental model. The distribution of total scores is very similar; the test-retest correlation is slightly higher in this version; and individual differences are large and significant. Furthermore, checks of the pattern of retinal sensitivity revealed once again the same map for the group data, with the 12° position and the temporal retina yielding greatest sensitivity.

DISCUSSION

The problem of the external validity of the test is necessarily a complicated one. That the test measures what it is supposed to, namely, night vision sensitivity, has been shown by a variety of means, but this does not prove that it will be a predictor of performance at night. In evaluating performance, consideration of motivation, intelligence, and numerous other factors must be taken into account. There is no doubt that an alert, intelligent man with poor sensitivity may perform

as well as a sleepy man with excellent sensitivity. On the other hand, it should be obvious that, given the same conditions in the 2 men, the one with superior sensitivity will give a better performance.

Thus, any attempt to correlate night vision scores with performance at night must include controls for, or measures of, other factors that would be relevant to performance. Such a project is a complicated one, but it could be undertaken for specific nocturnal tasks with the aim of weighting the various factors for their importance in prediction.

Without such an undertaking, however, one can raise the question of how much the differences in sensitivity between men might mean in a practical situation. The ratio of the sensitivity of the most sensitive man to that of the least, in terms of the visual angle seen 50 percent of the time, is 2.6. Disregarding atmospheric transmission, this means that the most sensitive man can see the same light as the least sensitive at a distance 2.6 times as great.

The illumination at the eye needed to be seen 50 percent of the time for each of the men, calculated from their liminal values, is .065 lumens per mile ^{2} for the poorest man and .0096 l/mi ^{2} for the best. This yields a ratio of 6.8 for the 2 men, or the square of the ratio in terms of diameter of visual angle. These values are, of course, smaller than those of the "safe" thresholds commonly assumed in calculations for the Coast Guard and others interested in estimating the distances at which beacon lights can always be seen by everyone.

From these values, one can calculate the distances at which specific sources of different candle power could be seen by the 2 men. For long distances, however, the loss of light due to the scattering and absorption by the atmosphere cannot be disregarded, since this loss is more important than the distance in determining the amount of illumination that reaches the observer's eye. In order to evaluate properly the 2 men, the formulation given by Middleton [9] and others [10, 11] for determining the visual range of various beacons through the atmosphere is used. This expression is:

$$E = Ix^{-2}e^{-\sigma x}$$

where E = illumination at the eye
I = intensity of the source
x = distance
σ = extinction coefficient of the atmosphere.

The following examples assume a dark surround and a clear night with $\sigma = .203$.

A source of 100 candles can be seen, by this formulation, by the least sensitive man at approximately 12 miles while the same 100 candle source would be just as visible to the most sensitive man at about 18 miles. The ratio here is thus reduced since the illumination

at the greater distance for the best man is more subject to loss by atmospheric transmission.

On the other hand, one may reverse the question and ask how intense a source is needed to be seen at a constant distance by the 2 men, thus equalizing the atmospheric effect. Calculations give a 7.3 candle source for the best man at 10 miles while the poorest man needs 49.5 candles at the same distance. The difference in individual sensitivity, by either method, is sizable and could be a major factor in the visibility of beacons at night.

SUMMARY

A new method of testing night vision sensitivity has been developed at the U.S. Naval Medical Research Laboratory. As an apparatus, the test is simple to reproduce and is compact and portable. As a testing device, it employs several unique principles that show promise in differentiating men reliably, according to their night vision sensitivity. These principles include testing sensitivity at numerous locations in the visual field, presenting 2 stimuli on each trial, and using different-sized stimuli from which a total score is compiled.

This test has been used to examine 30 naval enlisted men. The scores from the test show large individual differences and have a test-retest reliability of .89. The results in general were comparable to those found with 108 men tested on an experimental model. The questions of the meaning of the individual differences and of the external validity of the test are discussed.

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EYESTRAIN

It's tempting to believe that this eyestrain can bring about organic changes in the eyes, such as an increase in myopia or deterioration of retinal cell structure. Many people seem to believe this, but ophthalmologists have never found or had presented to them convincing evidence of such a cause and effect relationship. Most of them now believe that misuse of the eyes, even in childhood, by excessively prolonged reading, strained positions, or inadequate light, does not cause refractive errors to develop, intensify existing ones, or hasten the onset of degenerative ocular disease. Our ancestors, who read by firelight, had no worse eyes than we, and the eyes of aborigines, who can't read, seem, from all accounts, to fare no better than ours.—Bourne Jerome: Vision, Eyestrain, and Glasses. *The Journal-Lancet,* February 1960.

Medical Impairments and Military Effectiveness IV

Performance and Disposition of Inductees with Diagnoses of Rheumatic Fever and Rheumatic Heart Disease, Herniated Nucleus Pulposus, Anxiety Reaction, Abdominal Hernia, Pilonidal Sinus, and Varicose Veins; Considerations for Further Research

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RHEUMATIC FEVER AND RHEUMATIC HEART DISEASE

THE SPECIFIC MEDICAL DIAGNOSES included under the general heading of rheumatic fever and rheumatic heart disease in this study include the following:

Rheumatic fever, active, without heart involvement
Rheumatic pericarditis, active
Rheumatic endocarditis, active
Rheumatic myocarditis, active
Rheumatic fever, active, other and multiple types of heart involvement
Valvulitis, mitral, inactive, with deformity of valve, rheumatic or unspecified
Rheumatic valvulitis, aortic, inactive, with deformity of valve
Rheumatic endocarditis, inactive
Myocarditis, specified as rheumatic
Rheumatic heart disease, inactive

During the last major mobilization, that of World War II, cardiovascular defects were among the leading causes for rejection of selective

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From Walter Reed Army Institute of Research, Washington, D.C. This is the fourth and final article in the authors' study of "Medical Impairments and Military Effectiveness." Parts I, II, and III appeared in the June, July, and August issues, respectively, of this *Journal*.

service registrants. They were exceeded only by neuropsychiatric disorders, musculoskeletal defects, and failure to pass the mental examination. Rheumatic and other forms of valvular heart disease were reported as the leading cardiovascular defect noted among the estimated 300,000 men rejected for cardiovascular reasons on 1 January 1945.[20] Of the many problems incident to the heart examination as it is conducted at Armed Forces examining stations, the most important are: (a) many registrants do not recall a previous history of acute articular rheumatism and give a negative history and (b) the interpretation of early apical systolic murmurs is frequently exceedingly difficult with the conditions existing at Armed Forces examining stations.

These problems were studied by members of the subcommittee on cardiovascular diseases, National Research Council. Of 4,994 men formerly rejected because of cardiovascular defects and re-examined,[21] 82.7 percent were continued in the rejected or 4–F category and 17.3 percent were resubmitted as qualified for military service. The chief cause for rejection was rheumatic heart disease, found in 2,476 men or almost 50 percent of the total 4,994, and 59.9 percent of the final 4–F group. It was concluded after these re-examinations that "the wisdom of extending these re-examinations for the sake of salvage alone is doubtful in view of the time required, the few expert examiners available and the relatively small percentage of men reclassified as 1–A."

The current standard for enlistment and induction [18] specifies that "valvular heart disease is unacceptable for enlistment and induction," and further states that "acute rheumatic fever or verified history of single attack within the previous two years, or recurrent attacks of rheumatic fever at any time" are not acceptable. "Heart block of a significant degree" is unacceptable, yet "a slight increase in the P–R interval of the electrocardiogram in the absence of all other evidence of heart disease need not disqualify." This language implies, therefore, that persons who have had a single attack of rheumatic fever more than 2 years prior to the preinduction medical examination and who do not have evidence of residual heart disease will be acceptable for induction and enlistment.

Retention standards [17] specify that "the occurrence of rheumatic fever per se, occurring in the service, does not necessarily render an individual unfit," but that "the residuals and the chronicity of the disease are the determining factors." These standards further state that "if there are definite residuals involving the heart following a documented case of acute rheumatic fever, the individual may be considered unfit." Retention standards further state: "Individuals

retained in the service should have restricted assignments to a fixed installation where medical follow-up is available for 12–18 months," and "each case should be individualized." With regard to valvular heart disease, retention standards state:

> . . . individuals with known valvular heart disease are not knowingly accepted for military service. Many members with compensated valvular heart disease are able to undergo severe bodily exertion but because of the possibility of service aggravation, it is generally desirable to separate those individuals who are discovered to have valvular heart disease not acquired in the service. Individuals who acquired the valvular heart disease in the service, if asymptomatic, may be retained with appropriate assignment consideration. Individuals with symptomatic valvular heart disease should generally be considered unfit.

Most soldiers who were hospitalized with rheumatic fever were recommended for temporary or permanent assignment limitations. Following hospitalization, most soldiers were placed on prophylactic penicillin, sulfadiazine, or sulfisoxazole for prolonged periods. Typical of assignment limitations recommended are the following:

> Avoid all excessive physical and mental fatigue and inclement weather.
> Must have inside job.
> No field duty, no wet or cold conditions, avoid marching over ½ hour.
> No K.P., guard duty, P.T., exposure to cold or prolonged marching or walking.

Among the "unsuccessful" group of 173 soldiers, 98 (57%) were separated for disability that existed prior to service and was found to be "not service aggravated" in any instance, and 57 (33%) were separated for disability *with severance pay* and were entitled to a lump sum payment based on their length of service. Fourteen soldiers (8%) were placed on the temporary disability retired list. It is predicted that most of the latter will end up with permanent retirement. Also in the failure group, 4 soldiers (2%) were permanently retired, of whom 3 received 30 percent disability and 1 received 40 percent disability.

Among the 98 soldiers who were separated for rheumatic fever or rheumatic heart disease that existed prior to entry into the service, 51 had a residual mitral valvulitis, 18 had an aortic valvulitis, and 25 had both an aortic and mitral valvulitis. Four soldiers who had no detectable residual were separated solely because they had a recurrence of rheumatic fever shortly after entry into the service. Of 5 soldiers with valvular lesions and abnormal electrocardiograms, 4 had prolongation of the P–R interval and 1 had residual auricular fibrillation.

Of the 57 soldiers separated with severance pay, 29 had mitral valvulitis, 13 had aortic valvulitis, 7 had aortic and mitral valvulitis, 5 had abnormalities of the electrocardiogram as the only residual, and 3 had no residuals listed at the time of separation.

Of the 4 soldiers permanently retired, 1 received 30 percent disability because of aortic stenosis and insufficiency and prolongation of the P–R interval; 1 was permanently retired with 40 percent disability because of electrocardiographic evidence of chronic pericarditis secondary to active rheumatic fever and ankylosis of the knee not related to the rheumatic process; and 1 was permanently retired with 30 percent disability because of mitral and aortic insufficiency.

Among the 14 soldiers placed on the temporary disability retired list the following residuals were noted: 3 had evidence of chronic pericarditis secondary to rheumatic fever (the previous electrocardiographic abnormalities reverted to normal within 2 years after retirement in 2 of the 3 cases and these men have been removed from the temporary disability retired list); 4 had evidence of mitral valvulitis, in 2 of whom the diagnosis was mitral stenosis and insufficiency. (One of the soldiers with mitral stenosis had a mitral commissurotomy because of the severity of his symptoms; he has now been followed for 2 years and is working full time without difficulty as a paint salesman.) One soldier had evidence of aortic insufficiency and stenosis, and 5 had evidence of both aortic and mitral valvulitis. One soldier placed on the temporary disability retired list did not have any recognizable residuals at the time of retirement, but was recommended for retirement because of the following complications that occurred during the

Table 25. ***Disposition and length of service of Regular Army and AUS enlisted men sick in hospital or quarters with rheumatic fever or rheumatic heart disease in 1955. Percentage distribution***

Disposition	Length of service at time of admission												
	Less than 3 months		3 to 6 months		6 to 12 months		1 to 2 years		2 to 3 years		3 years or more		Total
	RA	AUS	RA	AUS	RA	AUS	RA	AUS	RA	AUS*	RA	*	RA & AUS
Duty**	36	34	41	47	65	56	65	60	51	(6)	67	–	53
Disability separation	43	46	50	43	27	38	27	32	47	(4)	27	–	37
Other	21	20	9	10	8	6	8	8	2	(6)	6	–	10
Total (%)	100	100	100	100	100	100	100	100	100		100	–	100
Number*** sick in hospital or quarters**	106	147	87	167	105	149	62	198	59	16	238	–	1,334

*AUS soldiers normally serve only 24 months.

**Weighted to equalize 50% sample of "duty" dispositions with 100% sample of "disability" and "other" dispositions.

***Since multiple admissions or diagnoses for 1 soldier are counted as separate admissions, number of admissions is greater than number of soldiers involved.

course of hospitalization: pneumonitis, pericarditis, myocarditis, polyarthritis, transient encephalopathy, hydrothorax, and atrioventricular block.

A comparison of the dispositions by length of service for all Regular Army and AUS enlisted men sick in hospital or quarters in 1955 with rheumatic fever or rheumatic heart disease (table 25) reveals no essential difference in disposition by component. This finding is interpreted to mean that disposition criteria are clear and that medical officers are following these instructions.

This study did not reveal a high incidence of associated psychosomatic or iatrogenic manifestations either among the "successful" or "unsuccessful" rheumatic fever groups. The data reported showed that the rheumatic fever "successful" men received proportionately as many promotions to higher grades and decorations, such as Good Conduct medals, as did the baseline sample of inductees. The rheumatic fever "successful" soldiers, however, did have significantly more duty days lost for medical reasons and sick-call visits than did the baseline sample. There were no significant differences between the 2 groups with respect to conduct and efficiency ratings, courts-martial sentences, or days lost for disciplinary reasons.

HERNIATED NUCLEUS PULPOSUS (INTERVERTEBRAL DISK SYNDROME)

Entry physical standards for enlistment and induction specify that persons with "a history of herniated nucleus pulposus (herniated intervertebral disk) with or without operation which has been symptomatic for one year or more, when neurological changes, postural deformity and limitation of motion of the lumbar spine are not present, and individual has been able to pursue full physical activity and has been without use of support or special sleeping apparatus for at least one year" will be found medically acceptable.[18] A subject is to be found unacceptable for enlistment and induction if he has "ruptured nucleus pulposus (herniation of intervertebral disk) or history of operation for this condition with a verified history of symptoms within the preceding year, or when neurological changes, postural deformity or limitation of the lumbar spine are present."[18] These standards are intended to exclude from military service those persons who have significant back disability as well as those whose back conditions might be aggravated by military service.

The disposition of soldiers who acquire herniated nucleus pulposus within the service or who have a recurrence of previous back symptoms antedating entry into the service is dependent upon the severity of the condition and the circumstances involved. Retention standards[17]

provide that "if after an appropriate period of treatment and observation there remain more than mild subjective symptoms and moderate or severe objective findings, the individual may be found unfit and separated for disability." These standards [17] also state that "If following surgery there are no residuals or only minimal residual findings such as hypoesthesia," the subject should be considered fit for military service.

Soldiers among the "successful" group attributed the precipitating cause of their back complaints to heavy lifting in 20 instances (16%), to direct trauma, such as a blow, fall, or jump, in 21 instances (16%), to activities associated with basic training in 21 instances (16%), and to athletic injuries in 8 instances (6%). The cause was not specified or preceded by any demonstrable or known trauma in 55 instances (46%). Sixty-eight soldiers in the "successful" group were treated conservatively and 57 persons were treated surgically after varying periods of conservative treatment.

All soldiers who were hospitalized for herniated nucleus pulposus had temporary assignment limitation recommended for 3 to 6 months or received permanent assignment limitations. Typical of the assignment limitations recommended are the following:

Permanent assignment limitation. No heavy lifting, excessive marching, prolonged standing, or long jeep rides.

Permanent assignment limitation. Duty not necessitating excessive lifting, bending, stooping, standing, marching, or any strenuous exercise.

Permanent assignment limitation. No lifting of weights in excess of 40 pounds, no prolonged standing in excess of 30 minutes at a time, no physical training, especially squat jumps and running.

Temporary assignment limitation for 6 months. No lifting over 15–20 pounds, no bending, crawling, walking over 1 mile and no riding in trucks or jeeps over 5 miles. Excuse from calisthenics.

Of the 72 soldiers in the "unsuccessful" group, 47 (65%) were separated for disability that existed prior to service and that was found to be "not service aggravated" in any instance. These persons are, therefore, not entitled to any compensation from the Army. Two soldiers were separated for disability with severance pay. Fifteen soldiers (2%) were placed on the temporary disability retired list; these men must be permanently retired, granted severance pay, or returned to a duty status within 5 years after temporary retirement. Of 8 subjects (11%) permanently retired, 1 was awarded 30 percent disability retirement, 3 were granted 40 percent disability retirement, 2 were granted 50 percent disability retirement, and 2 were granted 60 percent disability retirement.

Experience also indicates that the disposition of enlisted personnel following inpatient treatment for herniated nucleus pulposus is

influenced somewhat by their length of service. The longer an enlisted man has been in the service, the greater the possibility that he can return to duty upon his release from an Army medical treatment facility (table 26). The proportion of inductees returned to duty following treatment for herniated nucleus pulposus increased steadily from 22 percent of those with less than 3 months of service, to approximately 80 percent of those with 6 to 12 months or more of service. There were no significant differences between the proportions of regular Army and AUS enlisted men returned to duty from each length of service category.

The high incidence of disability separations in the first 3 months of military service occurs while the soldier is undergoing basic combat training. All the "less than 3 months" separations in 1955 were for soldiers who acquired the herniated nucleus pulposus before their military service. None of these men were treated surgically. Of the 37 soldiers separated during their first 3 months of service, 15 received no inpatient treatment but were carded for record purposes only and separated as soon as their disability was discovered.

It has been previously noted that admissions for herniated nucleus pulposus contribute to more than 10 percent of the days lost due to all medical conditions ordinarily classified under diseases of the bones

Table 26. ***Disposition and length of service among Regular Army and AUS enlisted men sick in hospital or quarters with herniated nucleus pulposus in 1955. Percentage distribution***

Disposition	*Length of service at time of admission*												
	Less than 3 months		*3 to 6 months*		*6 to 12 months*		*1 to 2 years*		*2 to 3 years*		*3 years or more*		*Total*
	RA	*AUS*	*RA*	*AUS*	*RA*	*AUS*	*RA*	*AUS*	*RA*	*AUS**	*RA*	*	*RA & AUS*
Duty**	(2)	22	(8)	63	84	80	86	69	79	(6)	90	–	81
Disability separation	(5)	62	(1)	26	11	12	6	9	2	–	5	–	10
Other	–	16	–	11	5	8	8	22	19	(1)	5	–	9
Total (%)		100		100	100	100	100	100	100		100	–	100
Number*** sick in hospital or quarters**	7	37	9	38	19	105	35	174	48	7	627	–	1,106

*AUS soldiers normally serve only 24 months.

**Weighted to equalize 50% sample of "duty" dispositions with 100% sample of "disability" and "other" dispositions.

***Since multiple admissions or diagnoses for 1 soldier are counted as separate admissions, number of admissions is greater than number of soldiers involved.

and organs of movement. More than 1 of every 10 admissions for herniated nucleus pulposus was a readmission.[12] This pattern of noneffectiveness and frequent readmission was also noted among the "successful" herniated nucleus pulposus inductees in this study.

The experience gained in this study indicates that inductees who were found acceptable for military service with a prior history of a back disorder, subsequently diagnosed as herniated nucleus pulposus, tended to have recurrence of back symptoms when they were undergoing basic or advanced training. In addition, since most military physicians who treat soldiers with the intervertebral disk syndrome during their basic or advanced training consider the syndrome to be incompatible with the activities incident to these training programs, a significant percentage are separated for disability during this period. These observations suggest either that existing concepts of the basic training program must be modified to exclude or restrict activities during the basic training period, for those persons who present a history of low-back complaints associated with the intervertebral disk syndrome; or that we must modify entry standards so that persons presenting a documented history of herniated nucleus pulposus at the preinduction examination will be excluded from the service. It is proposed that medical personnel identify these subjects early and arrange for modification of basic training consistent with their medical condition, inasmuch as there are many military jobs that can be performed adequately by those with mild residuals of the intervertebral disk syndrome.

ANXIETY REACTION

Among the individual psychoneuroses, anxiety reactions are responsible for the greatest manpower losses, in duty days lost for medical reasons, from year to year. This study indicates that many inductees with anxiety reactions were able to complete basic and advanced training and serve successfully in the continental United States and in all major overseas areas with all branches of the Army in a wide range of individual military jobs.

The median of duty days lost for medical reasons per subject for the "successful" group of soldiers with anxiety reactions was only 14 days for their 2-year period of military service. Readmissions to hospital or quarters in the same year because of anxiety reaction were no particular problem since only 9 inductees out of 290 shown on the initial roster of men on whom records were requested were admitted more than once in 1955. Whereas median of duty days lost for medical reasons per subject was low, the median of sick-call visits (14) per subject was relatively high. This pattern of treating anxiety

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reactions on an outpatient basis represents a recent trend and is extremely useful in reducing duty days lost for medical reasons.

The study indicates that, as with other disease entities, there is a relationship between disposition and length of service among both Regular Army and AUS enlisted men who, in 1955, were sick in hospital or quarters with the diagnosis of anxiety reaction (table 27).

Table 27. ***Disposition and length of service among Regular Army and AUS enlisted men sick in hospital or quarters with anxiety reaction in 1955. Percentage distribution***

Disposition	*Length of service at time of admission*												
	Less than 3 months		*3 to 6 months*		*6 to 12 months*		*1 to 2 years*		*2 to 3 years*		*3 years or more*		*Total*
	RA	*AUS*	*RA*	*AUS*	*RA*	*AUS*	*RA*	*AUS*	*RA*	*AUS**	*RA*	*	*RA & AUS*
Duty**	54	47	70	54	78	77	85	96	90	100	86	–	82
Disability separation	26	34	21	29	17	17	9	3	6	0	11	–	13
Other	20	19	9	17	5	6	6	1	4	0	3	–	5
Total (%)	100	100	100	100	100	100	100	100	100	100	100	–	100
Number*** sick in hospital or quarters**	44	80	68	111	103	151	143	177	144	24	847	–	1,892

*AUS soldiers normally serve only 24 months.

**Weighted to equalize the 50% sample of "duty" dispositions with the 100% sample of "disability separations" and "other" dispositions.

***Since multiple admissions or diagnoses for 1 soldier are counted as separate admissions, number of admissions is greater than number of soldiers involved.

The longer an enlisted man has been in the service, the greater the likelihood of his returning to duty upon release from an Army medical treatment facility. There was no significant difference between the proportion of Regular Army and AUS enlisted men returned to duty after 6 months of service. AUS enlisted men with anxiety reactions during the first 6 months of service were somewhat more likely than Regular Army enlisted men to be separated during this period. This difference may have been due, at least partially, to differences in the motivation of the 2 groups.

It was noted that Army medical service personnel of the Mental Hygiene Consultation Service made more of an effort during the training period to retain soldiers with anxiety reactions than was seen in studying other disease entities. Such efforts are commendable and consistent with effective manpower conservation.

With most of the other disease entities so far studied, it has been noted that, upon release from hospital or quarters status, an assignment limitation would be recommended by the medical officer. The pattern was somewhat different in the case of soldiers with anxiety reactions, who were usually returned to duty status without assignment limitation. Only 6 soldiers in the entire "successful" group received a recorded recommendation for assignment limitation upon release from hospital or quarters status. Although it was an infrequent occurrence to recommend assignment limitations following admission for anxiety reaction, it was observed to be a common practice for mental hygiene clinic or hospital personnel to telephone the unit commander or the first sergeant to explain what the psychiatrist believed to be the precipitating factor and to suggest corrective action. If the inductee was from a different post, similar information was furnished to the unit commander in writing.

The cases of admissions to hospitals or quarters with anxiety reactions studied undoubtedly represent the more severe anxiety reactions occurring in the Army. If the majority of those with severe anxiety reactions can be advantageously utilized, it seems logical to assume that inductees with anxiety reactions so mild that they were never hospitalized or placed in quarters status can probably be advantageously utilized by the military services.

ABDOMINAL HERNIA

Entry physical standards specify that inguinal hernia descending into the scrotum, recurrent hernia, postoperative hernia, and ventral and umbilical hernia, if large or moderate in size, are disqualifying for induction or enlistment.[18] A breakdown of the principal disqualifying defects among selective service registrants disqualified for medical reasons from July 1950 to December 1952 indicates that hernia of the abdominal cavity was responsible for 4.9 percent of the medical disqualifications. This figure was exceeded only by heart disease, neuropsychiatric disease, musculoskeletal disease, and bronchial asthma.[12]

Almost all Army enlisted men who were sick in hospital or quarters with any type of abdominal hernia in 1955 were returned to duty regardless of component or length of service (table 28). There were no meaningful differences in the disposition of Regular Army and AUS enlisted men.

Among the 455 soldiers in the present study were 206 who had evidence of an inguinal hernia recorded on their preinduction physical examination. These soldiers successfully completed their military

service and all except 6 completed basic combat and advanced training prior to undergoing surgery. There were no records indicating that basic combat and advance training caused any aggravation of the pre-existing hernia. Upon the patient's return to duty status it was common practice for medical officers to recommend that heavy lifting, prolonged marching, running, or straining be avoided for a period of 3 to 4 weeks, after which most soldiers were cleared for unrestricted activities.

Table 28. ***Disposition and length of service among Regular Army and AUS enlisted men sick in hospital or quarters with abdominal hernia in 1955. Percentage distribution***

Disposition	*Length of service at time of admission*												
	Less than 3 months		*3 to 6 months*		*6 to 12 months*		*1 to 2 years*		*2 to 3 years*		*3 years or more*		*Total*
	RA	*AUS*	*RA*	*AUS*	*RA*	*AUS*	*RA*	*AUS*	*RA*	*AUS**	*RA*	*	*RA & AUS*
Duty**	98	95	98	99	98	99	98	98	98	98	98	–	98
Disability separation	1	4	1	1	1	***	1	1	1	1	1	–	1
Other	1	1	1	***	1	1	1	1	1	1	1	–	1
Total (%)	100	100	100	100	100	100	100	100	100	100	100	–	100
Number † sick in hospital or quarters**	120	289	212	498	344	770	465	1,511	460	152	1,413	–	6,234

*AUS soldiers normally serve only 24 months.

**Weighted to equalize 50% sample of "duty" disposition with 100% sample of "disability" and "other" dispositions.

***Fewer than ½ of 1%.

†Since multiple admissions or diagnoses for 1 soldier are counted as separate admissions, number of admissions is greater than number of soldiers involved.

Of the entire sample of 455 inductees with a diagnosis of hernia, only 18 failed to complete their military service periods. One of the soldiers was permanently retired because of a large ventral hernia secondary to combat-incurred wounds of the abdomen that could not be corrected surgically. For 2 soldiers medically separated and placed on the temporary disability retired list, hernia was a secondary diagnosis, the primary medical diagnoses and the cause for separation being carcinoma and teratoma respectively. In 15 soldiers the diagnosis of hernia was recorded for disability antedating service. In 11 of the 15, hernia was a secondary diagnosis and not responsible for the separation; 1 had recurrent inguinal hernia; 1 had a large ventral hernia for which operative procedures were not recommended; and

in the remaining 2—the only 2 soldiers in the entire hernia sample who refused surgery—evidence of poor motivation for military service was documented.

Experience gained in the study of inductees with hernia, who were in hospital or quarters status with hernia in 1955, indicates that most soldiers who acquire hernia within the military service or who are inducted into the service with a hernia will accept an operative procedure to correct their medical defect and are able to perform useful service upon return to duty status. The median of duty days lost for medical reasons for the group as a whole was only 18 days for the 2-year period served. There were no significant differences between the hernia "successfuls" and the baseline group in regard to promotions and decorations received. Separation for disability because of a primary diagnosis of hernia was very infrequent. It is postulated, therefore, that persons with hernia, especially inguinal hernia, represent a manpower segment that could be advantageously utilized by the military services without assuming prohibitive liabilities.

PILONIDAL SINUS

Entry standards preclude acceptance of men with a pilonidal cyst or sinus that is discharging or that presents a tumor mass.[18] A draining pilonidal cyst, sinus, or associated tumor mass, even though recurrent, is seldom a cause for medical separation after the person enters military service, for most of these conditions can be effectively treated.[17] However, persons who develop infected or draining pilonidal sinus during military service may be expected to lose many duty days for medical reasons. In 1954 patients admitted for pilonidal cyst or sinus lost 108,000 days, producing a noneffective rate of 0.21 per 1,000 average daily strength. On the average, each of these patients remained 22 days in a hospital or in quarters on an excused-from-duty basis. Patients treated solely by conservative means averaged 7 days per admission, whereas surgical patients averaged 30 days per admission.[13]

In the present study 179 persons were treated exclusively by conservative means and 177 were treated surgically. As a rule, the latter were treated conservatively on 1 or 2 occasions prior to surgery. The average number of duty days lost during 2 years of military service by the group treated conservatively was 23 days. The average number of duty days lost by those treated surgically for the same period was 45 days. For the group as a whole, the median of days lost for medical reasons was 27 days. The median of times on sick call for the entire group was 9 times.

Disability separations because of pilonidal cyst or sinus were no particular problem inasmuch as only 12 soldiers were separated for disability. Of the 12 separations, 11 were for disability existing prior to enlistment, in 2 of which pilonidal sinus was a secondary diagnosis. In 1 soldier separated for disability with severance pay, the primary diagnosis was herniated nucleus pulposus, pilonidal sinus being a secondary diagnosis. Re-admissions were fairly frequent, particularly among soldiers treated conservatively.

Table 29. ***Disposition and length of service among Regular Army and AUS enlisted men sick in hospital or quarters with pilonidal sinus in 1955. Percentage distribution***

Disposition	Length of service at time of admission												
	Less than 3 months		3 to 6 months		6 to 12 months		1 to 2 years		2 to 3 years		3 years or more		Total
	RA	AUS	RA	AUS	RA	AUS	RA	AUS	RA	AUS*	RA	*	RA & AUS
Duty**	91	92	98	96	98	99	99	99	99	100	98	–	98
Disability separation	9	7	2	3	1	1	1	***	***	0	1	–	1
Other	0	1	0	1	1	***	0	1	1	0	1	–	1
Total (%)	100	100	100	100	100	100	100	100	100	100	100	–	100
Number † sick in hospital or quarters**	33	85	63	166	210	475	390	1,284	405	76	801	–	3,988

*AUS soldiers normally serve only 24 months.

**Weighted to equalize 50% sample of "duty" dispositions with 100% sample of "disability" and "other" dispositions.

***Fewer than ½ of 1%.

† Since multiple admissions or diagnoses for 1 soldier are counted as separate admissions, number of admissions is greater than number of soldiers involved.

Most soldiers returned to duty status were recommended for temporary assignment restrictions for a period of 1 to 3 months. The restriction most commonly recommended was to "avoid prolonged sitting, or riding in vehicles, and jobs where personal sanitation cannot be adequately maintained." Experience accumulated in this study indicates that there are many military jobs in which these soldiers can be utilized.

Most soldiers in hospital or quarters status with pilonidal sinus in 1955 were returned to duty regardless of component or length of service (table 29). There were no essential differences in disposition between Regular Army and AUS enlisted men.

Experience indicates that draining pilonidal sinus is responsible for approximately 2 percent of registrants disqualified at the preinduction medical examination.[12] If manpower needs during periods of major mobilization are acute, subjects with pilonidal sinuses appropriately treated represent a potential personnel source.

VARICOSE VEINS OF THE LEG

Varicose veins of the leg, if more than mild, or if associated with edema, skin ulceration, or residual scars from ulceration, are disqualifying for induction in the military service.[18] Although varicose veins are not among the most frequently disqualifying defects in preinductees, the condition is responsible for appreciable numbers of

Table 30. ***Disposition and length of service among Regular Army and AUS enlisted men sick in hospital or quarters with varicose veins in 1955. Percentage distribution***

Disposition	Length of service at time of admission												
	Less than 3 months		3 to 6 months		6 to 12 months		1 to 2 years		2 to 3 years		3 years or more		Total
	RA	AUS	RA	AUS	RA	AUS	RA	AUS	RA	AUS*	RA	*	RA & AUS
Duty**	(8)	(12)	(16)	97	100	98	96	99	100	96	93	–	96
Disability separation	(2)	(6)	–	3	0	1	4	0	0	4	4	–	2
Other	(1)	(1)	–	0	0	1	0	1	0	0	3	–	2
Total (%)				100	100	100	100	100	100	100	100	–	100
Number*** sick in hospital or quarters**	11	19	16	39	44	173	66	324	90	23	547	–	1,352

*AUS soldiers normally serve only 24 months.

**Weighted to equalize 50% sample of "duty" dispositions with 100% sample of "disability" and "other" dispositions.

***Since multiple admissions or diagnoses for 1 soldier are counted as separate admissions, number of admissions is greater than number of soldiers involved.

outpatient sick-call visits and for duty days lost for medical reasons. For this reason it was decided to determine how these soldiers were utilized and whether it is profitable, from a manpower standpoint, to retain them in the military service.

Most soldiers treated on an inpatient basis for varicose veins in 1955 were returned to duty status (table 30). There were no significant differences in disposition of Regular Army and AUS enlisted men.

In the "unsuccessful" group only 8 inductees were separated

for disability, in 7 of whom disability existed prior to service. Four of them reported at sick call and were immediately processed for separation without treatment. The diagnosis of varicose veins was a secondary diagnosis in 1 instance, with hematuria the primary cause of separation. In the 1 man permanently retired, the diagnosis of varicose veins was also a secondary diagnosis, with eczematoid dermatitis the primary cause for disability separation. None of the soldiers separated for disability was treated surgically.

Among the 210 "successful" soldiers admitted to hospital or quarters with varicose veins, 200 were treated surgically and 10 were treated nonsurgically. Among the conservative treatment group 2 inductees were offered surgery but refused; returned to full duty, they completed their obligatory period of military service. The median of times on sick call for soldiers admitted with varicose veins was 11 times and the median of days lost for medical reasons was 22 days during the 2-year period of military service.

Recommendations for assignment restrictions following surgery were temporary in most instances, usually for periods of 1 to 3 months. In most instances it was recommended that "long marches or prolonged standing be avoided." Soldiers treated conservatively were usually recommended for permanent assignment limitations similar to the temporary restrictions mentioned.

Experience gained in this study indicates that inductees with mild to moderate varicose veins can be utilized advantageously without a prohibitive number of duty days lost for medical reasons.

CONSIDERATIONS FOR FURTHER RESEARCH

Further research on the effectiveness of soldiers with various physical defects would be greatly facilitated by the development of reasonably sensitive performance criteria. Indexes of performance now available in Army records are few indeed. Conduct and efficiency ratings given enlisted men tend to be uniformly high except for those few cases where the soldier concerned has represented a fairly serious disciplinary problem to his superiors. Work performance per se is not really rated at all, so that careful measurement of the effects of given medical disabilities on soldiers' ability to perform in a given MOS is virtually impossible from records now routinely maintained on the individual soldier.

Future studies concerned with the effects of physical disabilities on military job performance should not confine themselves to hospital admissions caused by a given disease entity. In order to delineate clearly the problems posed by the disease entity in question, data

must also be gathered on soldiers with the given condition who are treated exclusively on an outpatient basis or who, perhaps, never even go on sick call.

Unfortunately, reliable statistics are not now readily available on what proportion of soldiers with a given medical condition are never hospitalized. Such statistics should be assembled in the future in order to facilitate judicious policy decisions regarding entry or retention medical standards. For example, regardless of the actual number of hospital admissions for asthma in any one year and regardless of the average length of stay in the hospital once hospitalized, the Army might well favor the induction and retention of asthmatics, if it were found that only 5 percent or 10 percent of them ever required hospitalization while in service. On the other hand, if it were found that 90 percent or 95 percent of asthmatics in the Army require lengthy or frequent hospitalizations, the Army would most assuredly not favor the military use of asthmatic subjects.

One means of gathering such data would be to conduct a longitudinal study of soldiers having a given medical condition upon entry into the service. In studying asthma, for example, samples of asthmatic and nonasthmatic soldiers in similar military jobs could be followed for a 2-year period or longer, during which time periodic performance ratings could be made by their noncommissioned officers and unit commanders. Days lost for medical reasons and sick-call visits could then serve as indicators of the relative medical load imposed by asthmatic as compared with nonasthmatic men.

It may be advisable in future research to distinguish clearly between effective performance of a specific military job and the medical risk inherent in that job for the soldier with a given disability. For example, it is conceivable that certain medical conditions might markedly reduce a soldier's ability to perform a given military job effectively even though that job might not necessarily aggravate his disability. Conversely, a soldier might be able to perform the duties of a given military job very effectively, but only at the cost of aggravation of some medical disability already present. Obviously, proper assignment policy must be based on both considerations. For research purposes, however, the performance and preventive medicine aspects involved in matching men to jobs can and should be analyzed as independent factors.

SUMMARY

The fundamental elements for possible validation of physical standards on the basis of military performance factors are described. Factors

involved in adequacy of military performance are delineated in terms of their frequency distributions for a baseline sample of 710 Army inductees *not* discharged for physical disability but given an honorable discharge after completing the normal 24-month period of military service.

Using this group as a yardstick, the medical and personnel records of 3,097 inductees treated in hospital or quarters status for perennial bronchial asthma, chronic otitis media, epilepsy, duodenal ulcer, knee joint injuries, rheumatic fever or rheumatic heart disease, herniated nucleus pulposus, anxiety reaction, abdominal hernia, pilonidal sinus, or varicose veins of the leg were studied in order to appraise the characteristics and accomplishments of those who successfully completed their 2-year military obligation and, secondarily, to review the factors responsible for the failure of those who did not complete their military service period.

The data reported in this study show that soldiers who were admitted to Army medical treatment facilities because of the disease entities discussed and who were subsequently returned to duty status had more duty days lost for medical reasons, more sick-call visits, and fewer promotions to higher enlisted grades than did the control sample. There were no significant differences between the 2 groups insofar as number of decorations received, courts-martial sentences, conduct and efficiency ratings, or days lost for disciplinary reasons. Nevertheless, a majority of inductees in each disease entity studied completed their military service, were promoted at least once, and performed a military job with what may be considered adequate effectiveness. These military jobs were performed in the United States and in all major overseas areas. Modification of selected portions of the training program or assignment restrictions seem to be indicated for many of the disease entities studied.

Among the 873 soldiers who failed to complete their 2-year service period, the following factors seemed to contribute to their failure: (a) severity of the disease process, (b) poor motivation for military service on the part of the soldier, (c) aversion on the part of the medical officer, personnel officer, or unit commander to utilizing or reassigning soldiers who are not physically perfect, (d) length of service when disability was discovered, (e) civilian education, and (f) history of the disease prior to entry into the military service.

These factors are discussed for each disease entity. Poor motivation of the soldier in the early months of military service and the attitude of medical officers, personnel officers, and unit commanders seemed to be the major factors contributing to the disability separation of inductees for the selected medical diagnoses.

Limitations of the study are discussed and recommendations for further research in this area are suggested.

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HAPPY COINCIDENCE

What would happen to the patient with pollinosis over the years if he were to forego injection therapy entirely? We cannot answer this, for it is rarely indeed that injection therapy is withheld from a patient with the "pollinosis syndrome" in clear form. Most of those we treat do well, to be sure, and our patients are certainly grateful. Nevertheless, we cannot rule out the possibility of a happy coincidence—the initiation of treatment in a year of less intense exposure to pollen, instruction in allergic cleanliness and in the intelligent use of drugs, the allaying of anxiety, spontaneous lessening of the patient's level of clinical sensitivity, and, last but by no means the least, the suggestion that accompanies the ritual of injection therapy. These, individually or in combination, might explain many a success without invoking any specific therapeutic or prophylactic merit for the solution that we put into the syringe.—FRANCIS C. LOWELL: American Academy of Allergy Presidential Address. *The Journal of Allergy*, March-April 1960.

Case Reports

Retained Deciduous Root Tips and Intrabony Pocket Formation

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MAJOR WILLIAM C. HURT, DC, USA

MANY FACTORS have been indicted in the formation of the intrabony periodontal pocket. To the best of our knowledge, no one has intimated that a retained deciduous root tip may sometimes be an agent contributing to such a condition. Retained deciduous root tips, mainly from the second deciduous molars, are frequently found in the premolar region of the mandible in adults, but they are rarely of clinical importance. A case with clinical significance is reported here.

CASE REPORT

A 38-year-old white man complaining of tenderness in the gums of the left mandibular canine region presented himself for treatment. Clinical examination of the lower left arch revealed evidence of chronic inflammation of the gingivae. The teeth were badly discolored with a brownish tobacco stain and had heavy deposits of supragingival and subgingival calculus. Less than 1° mobility was present in any of the teeth. Probing of the gingival crevice revealed pockets averaging 5 to 6 mm in depth about all teeth except the first molar. Here there were intrabony pockets 8 mm deep on the distal surface and 9 mm on the mesial surface. The latter pocket contained a hard foreign body that was easily probed. There was also beginning involvement of the bifurcation of the first molar on the buccal surface.

Radiographically (fig. 1), a funnel-shaped radiolucency mesial to the first molar contained an unidentified radiopaque body. There was evidence of crestal resorption between the first and second molars and in the cuspid-bicuspid area. Calculus spurs were noted in several places, and mesial drifting of the first molar was observed.

Treatment consisted of thorough periodontal scaling. Later, the area was re-evaluated for further definitive treatment. Because of the fibrous texture of the tissue involved and the pattern of the bone loss, a gingivectomy-osteoplasty combination was selected as the treatment of choice for complete pocket elimination. During this procedure, the mesial intrabony pocket of the first molar was

From the Dental Clinic, Womack Army Hospital, Fort Bragg, North Carolina.

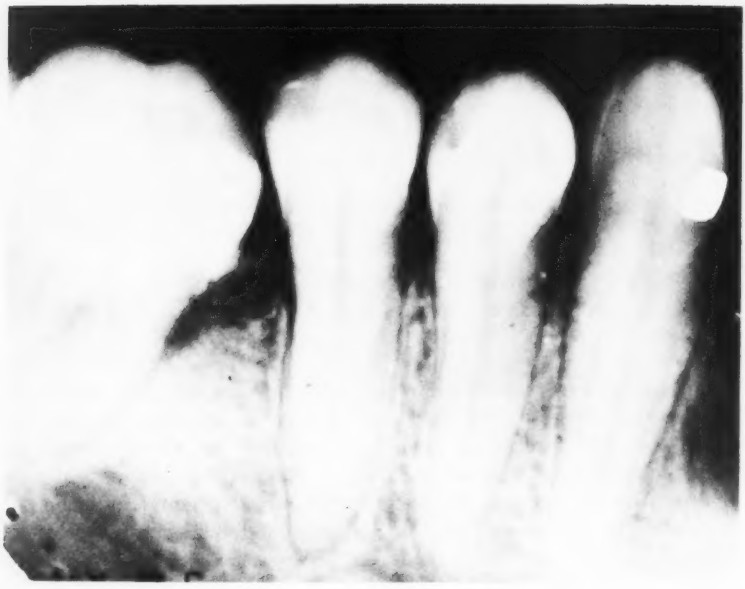

Figure 1. Roentgenogram, revealing intrabony pocket with deciduous root tip.

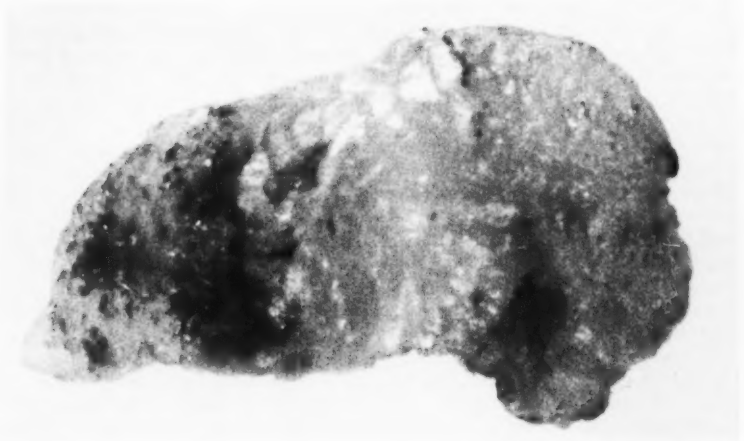

Figure 2. Deciduous root tip obtained from mesial intrabony pocket of lower left first permanent molar. Actual length was 5 mm.

explored with a curet and the movable foreign body was located and removed. Upon close examination, the object was found to be a retained deciduous root tip (fig. 2), 5 mm in length.

It was believed that this root tip was one of the contributing factors in the formation of the intrabony pocket; however, other agents certainly played a part.

SUMMARY

A case in which a retained deciduous root was apparently a factor in the development of an intrabony periodontal pocket is presented.

Lane's Ileal Band in Intestinal Obstruction

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THE CONDITION THAT HAS BEEN NAMED "Lane's ileal kink" was described by Lane [1-3] during the years 1908 through 1911. Recently, Paul and Fernando [4] reviewed the earlier reports of this lesion and presented 2 cases of small intestinal obstruction secondary to it. They also pointed out that Lane described an anatomic lesion but afforded it an incorrect role: "The essential feature of the lesion is a fibrotic thickening of the peritoneal attachment of the terminal ileum to the posterior abdominal wall. This peritoneal thickening extends from the antimesenteric border of the bowel about 2 inches from the ileocecal valve to the posterior abdominal wall just lateral to the brim of the pelvis." [4] Wolfer, Beaton and Anson [5] reported on the anatomic arrangement of the ileocolic attachment in 125 adults and found 2.4 percent with attachments similar to that described above. Forty [6] reported on 12 cases of obstruction by peritoneal bands in patients with no history of previous operation, but did not give details as to the location of the obstructive bands.

We are reporting 2 cases illustrative of this rare but definite cause for small intestinal obstruction, the diagnosis in each case having been chronic terminal ileitis because of the typical "string sign" on barium examination.

From Tripler Army Hospital, APO 438, San Francisco, Calif.

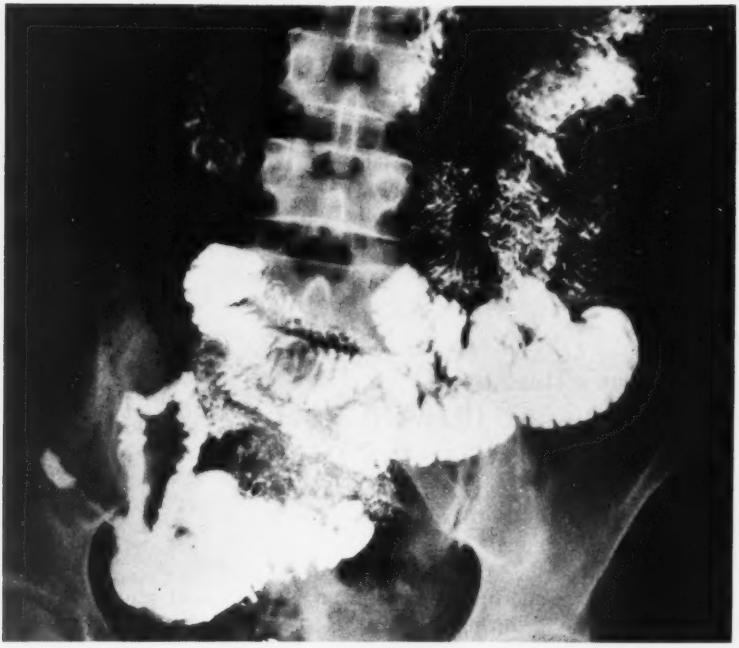

Figure 1 (case 1). Change in mucosal pattern of small intestine and partial obstruction of ileum.

CASE REPORTS

CASE 1. A 38-year-old white woman was admitted to this hospital with a 15-month history of abdominal distention occurring after eating and associated with noncrampy, lower abdominal discomfort. Seven months prior to admission, the patient noted increased abdominal distention and bilateral lower abdominal crampy pain. Because of continuing symptoms, the patient was seen at the referring dispensary where an upper gastrointestinal series was obtained 3 months prior to admission. This was interpreted as showing a change in the mucosal pattern of the terminal ileum associated with partial obstruction, consistent with regional enteritis (fig. 1). The gallbladder series was normal. Past and family histories and review of systems were noncontributory except for an appendectomy and uterine suspension at age 16. Physical examination and laboratory findings were completely within normal limits. Exploratory laparotomy revealed a peritoneal band extending from the posterior abdominal wall to the antimesenteric border of the terminal ileum, causing partial obstruction in this region. After division of this band, it was noted that the cecum and ascending colon had excessive mobility, and the cecum was fixed in the right lower quadrant. The patient tolerated the procedure well and the postoperative course was uneventful. During a 6-month postoperative follow-up, she was completely symptom free.

CASE 2. A 53-year-old white man had a history of chronic intermittent small intestinal obstruction, characterized by abdominal cramps and loud intestinal noises that would awaken him from sleep. This had been present for about 2 years but was much more pronounced in the past 3 months. There had been some weight loss, and barium examination was so characteristic of the "string sign" of terminal ileitis that these films were placed in the radiologic teaching files. Operation performed by one of us (WFB) revealed that a broad band from the antimesenteric border of the terminal ileum to the root of the mesentery was causing obstruction by longitudinal torsion of the bowel. When the deformity was corrected by an incision parallel to the intestine, the caliber of the obstructed loop was found to be normal. The denuded area was covered by a line of suture at right angles to the intestinal lumen. The patient was completely relieved of his symptoms and is known to be well 5 years later.

DISCUSSION

Operative correction spared these patients years of medical management that would probably have been ineffective. In case 1, the band evidently represented faulty fixation of the cecum and terminal ileum; in case 2, the band supplemented normal fixation. Chronic obstruction of the terminal ileum by Lane's ileal band should be considered where typical radiologic evidence of terminal ileitis is not accompanied by any history of a previous acute or subacute phase of the disease. Treatment is by division of the band, followed by cecal fixation or simple reperitonealization of the denuded loop of intestine as indicated.

SUMMARY

In 2 patients with chronic obstruction of the terminal ileum by Lane's ileal band, the preoperative diagnosis was "regional ileitis" of the terminal ileum because of the typical "string sign" reduction in caliber and change in mucosal pattern. In both cases surgical correction relieved the obstruction.

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AFEB Official Statement on the Use of Griseofulvin in Superficial Fungal Infections

THE ARMED FORCES EPIDEMIOLOGICAL BOARD has approved the following official recommendations of its Commission on Cutaneous Diseases for the use of griseofulvin within the military medical services.

CHEMISTRY AND PHARMACOLOGY

Griseofulvin is a water insoluble, thermostabile, bitter white powder obtained as an antibiotic by fermentation of several species of penicillia. It is chemically unrelated to any other antibiotic now in use. Oral administration results in a peak concentration in the blood for 72 to 96 hours. Most, but probably not all, of the drug is absorbed following ingestion. Griseofulvin is found in most of the tissues and is present in detectable amounts in the epidermis of the skin in about 48 hours. Active material is apparently deposited in the stratum corneum, the hair, and the nails, as these structures are formed and is transferred to the periphery at the same rate as the normal growth of these keratinous structures.

MICROBIOLOGIC ACTIVITY

Griseofulvin is highly active against all known species of *Trichophyton*, *Microsporum*, and *Epidermophyton* (approximately 0.1 to 0.4 micrograms per ml of broth). It is not effective against *Candida albicans*, tinea versicolor or erythrasma, or against any of the human, deep fungal pathogens. In vitro studies have demonstrated that although fungistasis may be complete during weeks of submersion in a griseofulvin-containing medium, transfer to fresh medium is followed by resumption of fungal growth. A low degree of antibiotic resistance has been induced in vitro. The ability of fungi to destroy griseofulvin in vitro has made such studies, particularly those on solid media, difficult to interpret. What some have reported as resistance is in reality a cultural artifact. The rare strains that seem to have developed resistance in vitro promptly lost their resistance when transferred to animals.

TOXICOLOGY

The experience to date suggests that the toxicity for man in therapeutic doses is low. The vast majority of patients note no adverse signs or symptoms while taking griseofulvin. Occasional patients report gastrointestinal distress or loose stools or headaches, all of which usually subside on continued ingestion of the

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Prepared for the Board by the Commission on Cutaneous Diseases, Dr. Donald M. Pillsbury, Director.

drug. Urticaria has been noted, but disappeared on cessation of the griseofulvin, and only in some did it reappear on readministration. An erythematous morbilliform eruption similar to other drug eruptions apparently occurs quite rarely. A very few patients have reported ill-defined dizziness, or a deliberateness and slowing of reaction time to coordinated movements, particularly at a dose of 2.0 grams per day. Because of interference with accurate prompt control of aircraft, it is suggested that rated personnel not fly while taking griseofulvin.* It is worth noting that these psychomotor changes have been found in only 3 or 4 subjects to date and seem to have disappeared when the dose was lowered to 1.0 gram a day. Nonetheless, the observations, although rare, are well documented and for military personnel cannot be disregarded.

A colchicine-like cytotoxicity in rapidly dividing cells has been reported in animals receiving approximately 50 times the usual therapeutic dose when the drug was administered parenterally rather than orally. For this reason detailed studies of bone marrow, of peripheral blood, of testicular biopsies, and sperm counts have been done on many patients. The only changes noted after 4 to 6 months of administration of griseofulvin were transitory ones in some of the earlier white blood counts. Most but not all authorities tend to believe that these were unrelated to the drug, and that it has little if any hematotoxicity. The value of repeated blood counts in patients receiving griseofulvin may be questioned. It is reasoned that since thousands of patients given the drug for long periods have failed to reveal significant bone marrow depression, further routine search for this effect is without much value. In addition, any serious reaction, such as agranulocytosis, that might now occur would be of the explosive allergic type and would probably reveal itself by other signs long before a routine monthly blood count would detect it.

Studies of liver and kidney function as well as other organs in man have shown no detrimental effects from large and long-term administration of griseofulvin. There may be a slight increase in 24-hour urine protein output, but it is of such a degree as to be undetected by most routine studies, and its significance, if any, has not been determined.

USE AND ADMINISTRATION

When taken by mouth griseofulvin is effective against skin, nail, and hair infections produced by the dermatophytic fungi. It is not effective against other diseases that clinically may resemble such infections; therefore, an accurate etiologic diagnosis is particularly desirable before starting the drug. Direct examination of scales with potassium hydroxide and culture on appropriate media are indicated. However, this will often not be possible under field conditions.

The necessity for prolonged treatment in many patients underlines the need for a correct diagnosis.

At the present time the recommended daily dose of griseofulvin for adults is 1 gram. It is not yet known whether there is any advantage in dividing the dose during the day or giving it all at once. Occasional patients with culturally proved ringworm fungous infections may require larger doses for complete

*In accordance with U.S. Air Force and U.S. Army policy, rated personnel *must* be grounded while taking griseofulvin.

clearing of lesions. Relapse or partial failure is more common with less than 1.0 gram per day. The details of treatment are best described for each area of the body involved.

TINEA CORPORIS

Ringworm of the body or groin. Small localized patches may be treated successfully with standard topical fungicides, but if the lesions are extensive, particularly involving the groin and buttocks, oral griseofulvin is the treatment of choice. Itching usually diminishes after several days of administration, but treatment should be continued until the skin is normal in appearance. Occasionally residual pigmentation may remain, but is of no significance. The drug should be continued daily for a minimum of 2 weeks and probably an optimum period of 3 or 4 weeks. Some patients may require even longer therapy. Careful examination of the feet and nails should be done to be certain that these are not also involved.

TINEA PEDIS

Dermatophytosis of the feet. In acute moist vesicular lesions, soothing compresses and mild topical agents are indicated. Often, little else is needed. Griseofulvin is of limited benefit in this state of the disease. Cultures should be done and if *Trichophyton rubrum* is isolated, even in the acute case, griseofulvin should be administered. Topical application of griseofulvin is probably without value. In thickened subacute scaling forms of tinea pedis with symptoms, oral griseofulvin usually is the treatment of choice. Concomitant topical therapy with fungicidal preparations produces better results than either griseofulvin or topical therapy alone. The treatment should be continued until the skin is normal in appearance. Many experts now feel that in all symptomatic tinea pedis from which *Trichophyton rubrum* is isolated, griseofulvin should be given by mouth to shorten disability and possibly reduce the future likelihood of chronic, troublesome tinea pedis. However, complete cure seems unlikely in a majority of cases, especially if the toenails are infected. In tinea pedis from which other fungi are isolated, griseofulvin is not mandatory, but in some cases may be desirable.

ONYCHOMYCOSIS

Fungal infection of the nails. *Trichophyton* or *Epidermophyton* infections which cause distortion and mutilation of the fingernails should be treated with griseofulvin (1.0 gram/day) for a minimum of 4 months, or until the nail plate and subungual areas are normal in appearance. The same changes in the toenails are of less inportance. Ordinarily, onychomycosis of the toenails is not painful or disabling, and therefore requires treatment only if it is serving as a focus of fungal infection and persistent or recurrent lesions elsewhere on the body. Dermatologic consultation may be required for this decision. The rate of growth of the toenails is about half of the fingernails, so that successful treatment often takes 6 to 8 months or even longer. Evulsion of the nail seems to speed up regrowth of healthy nail. However, the combined use of surgical evulsion with griseofulvin is still under investigation, and cannot be recommended at this time.

ARMED FORCES EPIDEMIOLOGICAL BOARD

TINEA CAPITIS

Fluorescent ringworm of the scalp is limited almost entirely to children. Treatment should consist of 3 grams of griseofulvin given in 1 day, with observation at monthly intervals and re-treatment at the end of 1 and if necessary 2 months' observation in the few cases not successfully cured by the single dose. Clipping of the hair may be carried out at the end of 3 weeks to remove distal infected material.

Nonfluorescent ringworm of the scalp occurs in children and adult females. It should be treated with daily griseofulvin for 4 to 6 weeks until all signs of infection are absent. In children a daily dose of 15 mg per pound of body weight is recommended. A single-dose regimen may be effective here, but definitive data on this point are not yet available.

TREATMENT OF CANCER

The present status of cancer therapy recalls the level of treatment of infectious disease in the premicrobiologic era. Before the advent and availability of sera, toxins, vaccines, and chemotherapeutic agents, not all patients with so-called "fatal" infectious disease died. Indeed, the use of poultices, bleeding, and other now-abandoned procedures was credited with cures. May not the treatment of cancer be in an analogous situation today? Milestone accomplishments did not result from experimental efforts aimed at producing hotter poultices or more efficient methods of venesection. Rather, the concepts of the bacterial origin of disease and prophylaxis through immunization resulted from the unorthodox thinking. The roots of heresy in both thought and action traditionally find fertile soil in the debris incidental to the failure of orthodox beliefs.—PAUL KOTIN: Cancer Heterodoxy. *Surgery, Gynecology & Obstetrics*, May 1959.

Did you enter the June Poll of Readers?

Do it now!

Military Medical News

General Cooney Retires; Named Medical Director of the American Cancer Society

Completing more than 30 years of active military service, Major General James P. Cooney, MC, USA, chief surgeon, European command, and former deputy surgeon general of the Army, retired at the end of August. He has accepted the position of medical director of the American Cancer Society, New York, N.Y.

During General Cooney's brilliant military career, he achieved distinction as an authority on radiology and atomic medicine, representing the Army surgeon general in numerous radiologic surveys. In 1946 he was assigned to the Manhattan Engineering District to train for the Bikini tests, and went on a special mission to Japan to study the A-bomb survivors at Hiroshima and Nagasaki. He later served on the staff of Lieutenant General Quesada during the Eniwetok tests.

Upon returning from Japan, the general served consecutively as medical director of the Manhattan Engineering District; as consultant to the Armed Forces Special Weapons Project; and as director of the Special Projects Division, in the office of the Army surgeon general.

General Cooney was subsequently named chief of the Radiologic Branch of the Division of Military Application, U.S. Atomic Energy Commission, with additional duties as consultant to the Armed Forces Special Weapons Project. During his tenure as commandant, Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston, Texas, he was called to Washington to assume the duties of deputy surgeon general.

The general received his medical degree in 1927 from the University of Iowa Medical School and entered the Army Medical Corps Reserve, interning at Fitzsimons Army Hospital, Denver, Colo. Early in his military career he served at Letterman Army Hospital, San Francisco, Calif.; the Military Academy Station Hospital, West Point, N.Y.; Walter Reed Army Hospital, Washington, D.C.; the Gorgas General Hospital, Panama Canal Zone; and the Sternberg General Hospital, Manila, P.I. He has been awarded the Legion of Merit, the

Major General Cooney

Bronze Star Medal with Oak Leaf Cluster, and the Army Commendation medal.

General Cooney is a diplomate of the American Board of Radiology, a fellow of the American College of Chest Physicians and the American College of Radiology, and a member of the Radiologic Society of North America, the National Tuberculosis Association, the Radiation Research Society, the Roentgen Ray Society, and the American Medical Association.

Area Surgeons Reassigned

The end of the fiscal year brought numerous top level changes in the Army's Medical Department. With the exception of surgeons of the Second, Sixth, and Eighth U.S. Army areas and the Military District of Washington, all other area surgeons have reported for new assignments.

Colonel Joe A. Bain, MC, USA, Surgeon, Fourth U.S. Army, Dallas, Texas, retired from active duty at the end of June and has been replaced by Colonel William M. Roe, Jr., MC, USA, who recently returned from his assignment as Surgeon, Seventh U.S. Army, Europe. Replacing Colonel Roe in Europe is Colonel Norman Peatfield, MC, USA, formerly with the Medicare Division, Office of the Surgeon General, U.S. Army, Washington, D.C. Colonel W. D. Graham, MC, USA, former Third U.S. Army Surgeon, Fort McPherson, Ga., has replaced Colonel Peatfield at the Medicare Division. Returning from Europe, Colonel Angvald Vickoren, MC, USA, has assumed duties as Third U.S. Army Surgeon, replacing Colonel Graham.

Retiring from active duty in June, Colonel George E. Leone, MC, USA, Surgeon, Fifth U.S. Army, Chicago, Ill., has been succeeded by Colonel Sterrett Dietrich, MC, USA, who is the former Surgeon, U.S. Forces, Alaska. Colonel Francis L. Carroll, MC, USA, has assumed Colonel Dietrich's duties in Alaska.

Replacing Colonel Howard W. Doan, MC, USA, at First U.S. Army, New York, N.Y., is Colonel Frank J. Vita, Jr., MC, USA, who recently returned from an assignment in Italy. Colonel Doan has been assigned to the Army Surgeon General's office, Washington, D.C.

Air Force Film Cited

The U.S. Air Force has received a special award for a film entitled "Air Travel and the Cardiopulmonary Patient," presented during the showing of scientific motion pictures at the 26th annual meeting of the American College of Chest Physicians, Miami Beach, Florida.

Lieutenant Colonel Robert B. Stonehill, USAF, MC, Lackland Air Force Base, San Antonio, Texas, who acted as technical advisor for the film, received the award on behalf of the U.S. Air Force during the president's banquet concluding the 5-day meeting.

Official Decorations

The following awards were recently announced by the Department of the Army.

Army Commendation Ribbon with Metal Pendant

Brawner, Selma M., Maj., ANC
LeGolvan, Paul C., Col., USA*
McBurney, Harold, Col., DC, USA
Ogren, Oscar, Col., MC, USA
Taylor, Ruth P., Lt. Col., ANC*

Air Force Commendation Medal

Rule, William R., Maj., USA

*First oak leaf cluster.

Colonel Cameron Retires

Colonel Joseph M. Cameron

June 30th was the last day of active duty in the colorful career of Colonel Joseph M. Cameron, MC, USA, who for the past 8 years has been senior medical officer at the U.S. Army Chemical Corps School, Fort McClellan, Ala. The soldier, neurosurgeon, teacher, and author retired after more than 30 years of military service.

Colonel Cameron joined the Army as an enlisted man in 1920 and later served as an officer in the Coast Artillery until he entered the University of Pittsburgh Medical School, where he received his medical degree in 1929. After 8 years of study in Chicago, Ill., and Vienna, Austria, he became a qualified neurosurgeon. Teaching at the University of Chicago for 4 years, he re-entered the service as a medical officer in 1941.

During World War II, the colonel served at Fitzsimons Army Hospital, Denver, Colo., and Walter Reed Medical Center, Washington, D.C. He later saw action in the allied invasion of France at Normandy and the Battle of the Bulge in northern France and Belgium, and won the Bronze Star medal and the Purple Heart. After the war, he helped disband Medical Service units at Camp Sibert, Ala., and trained younger doctors to help care for the thousands of neural casualties across the nation.

Returning to Europe in 1948 to serve with the army of occupation in Germany, he was assigned as a neurosurgeon at the 98th General Hospital, Munich, and also served as commander of the 10th Field Hospital in Bavaria, commandant of the European Command Medical School, and commanding officer of the Medical Training Command.

He is a member of the American Medical Association and a fellow of the American College of Surgeons. The author of a number of professional articles, he recently completed a book entitled "The Anatomy of Military Merit."

Officers Certified by Specialty Boards

The surgeons general of the military medical services have announced that the following regular Medical Corps officers have been certified by the specialty boards indicated.

American Board of Anesthesiology

Cranston, Robert W., Jr., Lt. Col., USA

American Board of Dermatology

Burt, Howard, Capt., USA
Ford, Samuel M., Capt., USA

American Board of Internal Medicine

Czarnecki, Stephen W., Capt., USA
Ransome, James W., Capt., USA

American Board of Neurological Surgery

Kempe, Ludwig G., Lt. Col., USA

American Board of Obstetrics and Gynecology

Boyson, William A., Maj., USA
Burke, Francis W., Comdr., USN
Cochrane, Charles R., Maj., USA
Lauderdale, James M., Maj., USA
Worrall, Joseph A., Jr., Lt. Col., USA

American Board of Ophthalmology

Guida, Anthony J., Comdr., USN
Hadlund, Ralph L., Lt., USN
Lubeck, Marvin J., Capt., USA
Stonecypher, David D., Capt., USA

American Board of Orthopedic Surgery

Reed, Charles, R. W., Lt. Col., USA

American Board of Pediatrics

Bicknell, Donald R., Capt., USA
Canby, John P., Capt., USA

American Board of Pathology

Johnson, Thomas S., Lt. Comdr., USN

Pathologic Anatomy

Batsakis, John G., Capt., USA
Landry, Gelmar S., Capt., USA

Clinical Pathology

Batsakis, John G., Capt., USA

American Board of Preventive Medicine

Aviation Medicine

Morris, David P., Jr., Comdr., USN

American Board of Plastic Surgery

Trier, William C., Comdr., USN

Parsons Gets Skinner Medal

Captain Robert Wilton Parsons, MC, USA, has been named winner of the Skinner Medal in a ceremony at Brooke Army Medical Center, Fort Sam Houston, Texas. The award was made by Major General Lewis S. Griffing, deputy commander, Fourth U.S. Army.

The medal, established by Dr. John O. Skinner, a contract surgeon with the Army around 1870, is awarded to the medical officer with the highest scholastic rating in the officers' advanced course at the Army Medical Service School each December and June, to encourage early field training for medical officers. Captain Parsons is the thirty-sixth physician to merit the award, succeeding many officers who have been internationally recognized for their achievements in military medicine.

Captain Parsons received his medical degree in 1954 from the Washington University School of Medicine in St. Louis and completed his internship at Salt Lake General Hospital, Salt Lake City, Utah, before entering the Army. After attending a company-level course for medical service officers at the Army Medical Service School he had a 4-year residency in surgery at Fitzsimons General Hospital, Denver, Colo.

Progress Notes

Major **Milton A. Lewis,** MSC, USA, Personnel and Training Division, Office of the Surgeon General, U.S. Army, recently received his gold leaves, signifying his present rank . . . Captain **Marcos A. Godinez,** MC, USN, District Medical Officer, 10th Naval District, will report to the U.S. Naval Mission in Caracas, Venezuela, for duty.

Walter Reed Army Medical Center's 17-year-old 1-million volt x-ray will soon be retired, after being used in the treatment of more than 170,000 patients in the destruction of cancer cells. The machine will be replaced by two more modern units, a 2-million volt x-ray and a cobalt ^{60} tele-therapy unit, capable of producing gamma radiation to the approximate equivalent of 3-million volt x-ray.

Lieutenant Colonel **Donald Vivian,** USAF, MC, hospital commander, USAF Hospital, Ernest-Harmon Air Force Base, Newfoundland, was honored by the Stephenville, Newfoundland Chamber of Commerce upon his departure to attend the Air War College, Maxwell Air Force Base, Ala. . . . Lieutenant Commanders **Donald L. Baxter,** MC, USN, U.S. Armed Forces Institute of Pathology, Washington, D.C., and **William E. Carson,** MC, USN, U.S. Naval Hospital, Great Lakes, Ill., have recently been promoted to their present rank.

Captain **David E. Waugh,** MC, USA, medical officer, U.S. Army Recruiting Main Station, Des Moines, Iowa, has been reassigned to Brooke Army Hospital, Fort Sam Houston, Texas, where he will assume the duties of dispensary officer . . . Lieutenant Colonel **Martha E. Moseman,** AMSC, has returned to Brooke Army Hospital, Fort Sam Houston, Texas, where she once served as Fourth U.S. Army Procurement Officer, for the Army Medical Specialist Corps. She will replace Lieutenant Colonel **Katherine E. Manchester,** AMSC, as chief, Food Service Division. Colonel Moseman left Brooke for duty as Chief, Dietitians Section, Office of the Surgeon General, Washington, D.C.

Colonel **Frank H. Van Wagoner,** MC, USA, chief surgical consultant, Office of the Army Surgeon General, retired from active military service in June to become the medical director of Rethomason General Hospital, El Paso, Texas.

Lieutenant Colonel **Alonzo M. Donnell,** USAF, MSC, Headquarters TAC, Langley Air Force Base, Va., has been assigned to the Medical Training Branch, Office of the Air Force Surgeon General, Washington, D.C. He will replace Major **James M. Kennedy,** USAF, MSC, who has been ordered to report to the 1079th Medical Service Squadron, Brooke General Hospital, San Antonio, Texas . . . Commander **Robert G. Luckie,** MSC, USN, is the new chief of the Armed Services Medical Regulating Office, Washington, D.C., succeeding Lieutenant Colonel **Clarence E. McKeown,** MSC, USA.

Lieutenant Commander **Ruth Moeller,** MSC, USN, and Lieutenant (jg) **Ann C. Hatten,** MSC, USN, physical therapists on duty at the U.S. Naval Medical School, Bethesda, Md., and the U.S. Naval Hospital, Great Lakes, Ill., respectively, represented the Bureau of Medicine and Surgery, Washington, D.C., and monitored an educational exhibit at the annual meeting of the American Physical Therapy Association held recently in Pittsburgh Pa.,

The 50th Medical Company, 428th Medical Battalion, Stilwell Field,

Fort Benning, Ga., has been awarded the US Continental Army Command STRAC Superior Unit Award. The occasion also served as change of command ceremonies when Lieutenant Colonel **Raymond J. Caldbeck,** MC, USA, succeeded Lieutenant Colonel **Charles R. Wolf** MC, USA, as commanding officer of the battalion. Colonel Wolf has been assigned to the Office of the Deputy Chief of Staff for Logistics, Washington, D.C.

Clegg Replaces James At 9th Naval District

Rear Admiral Walter F. James, MC, USN, district medical officer, Ninth Naval District, Great Lakes, Ill., has retired from the U.S. Navy, following more than 34 years of service with the Medical Department. Admiral James was relieved by Rear Admiral Courtney G. Clegg, MC, USN, who will take over his new duties following a tour in the Fourteenth Naval District, as Fleet Medical Officer, U.S. Pacific Fleet Command.

Admiral James was commissioned a lieutenant (jg) in the Medical Corps in 1926 after graduating from the University of Illinois School of Medicine. Some of his more recent assignments have been as commanding officer, U.S. Naval Hospitals, Yokosuka, Japan, and San Diego, Calif., and district medical officer, Thirteenth Naval District. Upon his retirement, Admiral James was presented a Certificate of Exceptional Service from the Surgeon General of the Navy, Rear Admiral Bartholomew W. Hogan.

Admiral Clegg, who completed his 33rd year of naval service in June, is a native of Greenville, Texas, and was graduated from the University of California Medical School in 1927. Commissioned a lieutenant (jg) in the Medical Corps that year, he served his internship at the U.S. Naval Hospital, San Diego, Calif. Admiral Clegg has had former assignments as executive officer, U.S. Naval Hospital, Chelsea, Mass.; commanding officer, U.S. Naval Hospital, Philadelphia, Pa., and district medical officer, First Naval District.

Rear Admiral James

Rear Admiral Clegg

ARMY EXHIBIT WINS CERTIFICATE OF MERIT. A prize-winning Army exhibit at the recent American Medical Association Meeting at Miami Beach, Fla., was the entry of the U.S. Army Surgical Research Unit, Brooke Army Medical Center, Texas. Congratulating Colonel Edward H. Vogel, MC, USA, right, commanding officer of the unit, is Captain Roger H. Fuller, MC, USN, deputy director, U.S. Armed Forces Institute of Pathology, Washington, D.C. The exhibit was one of three Army exhibits to receive awards, with honorable mention going to Lieutenant Colonel Walton M. Edwards, MC, USA, and Captain Stephen P. Dittman, MSC, USA, of Landstuhl Army Hospital, Germany, and to Lieutenant Colonel Gordon W. Vacura, VC, USA, Walter Reed Army Institute of Research, Washington, D.C.

King of the Greeks Decorates Shilling

Captain Charles W. Shilling, MC, USN (Ret.), former senior medical officer of the U.S. Naval Academy, and former director, Research Division, Bureau of Medicine and Surgery, Washington, D.C., has received the Golden Cross of the Order of the Phoenix, at Athens, Greece.

Captain Shilling, deputy director, Division of Biology and Medicine, U.S. Atomic Energy Commission, received this honor for his contributions to Greece's atomic energy program, especially with respect to biomedical matters. Dr. Shilling assisted a number of Greek scientists and physicians who visited this country to learn of the United States atomic energy activities.

The citation, signed by Paul the Second, King of the Greeks, was presented by the Greek Minister of Foreign Affairs during Dr. Shilling's recent visit to Athens.

Air Force MSC Chief Named

Colonel Bernard Korn, USAF, MSC, has been appointed chief, Medical Service Corps, USAF Medical Service, replacing Colonel Leonard P. Zagelow, USAF, MSC, who has been reassigned to the Fifth Air Force, Japan.

Colonel Bernard Korn

Colonel Korn received his Bachelor of Science (Pharmacy) degree in 1938 from Columbia University and entered the service on active duty by direct commission in 1939. He has served with the First Medical Regiment, Carlisle Barracks, Pa., and with the old Tripler Army Hospital, Hawaii; and was executive officer of the 1500-bed Bruns General Hospital, Santa Fe, N. Mex.

During the latter part of World War II, Colonel Korn performed the duties of executive officer to the Base X Surgeon, Manila, P.I., and then assumed command of the PHILRYCOM medical depot for approximately 2 years. Upon his return to the States he served as chief, Materiel Standards Division, Armed Forces Medical Procurement Agency, Brooklyn, N.Y.

From 1952 to 1956 he was assigned as chief, Medical Materiel Division, Office of the Surgeon General, USAF, and was responsible for the development of USAF operating and reserve medical materiel requirements worldwide, including the initiation of procurement actions. Subsequent to his Washington tour, he performed the duties of director of Plans, Staffing, and Hospitalization for the Surgeon, Pacific Air Forces.

Historical Data Wanted on Army Nurse Corps

The United States Army Medical Service Historical Unit in Washington, D.C., under the direction of the Surgeon General, is engaged in preparing the history of the United States Army Nurse Corps. The introductory portion of this volume will depict the background that led to the establishment of the Army Nurse Corps. Other portions will be devoted to the organization and professional achievements of the Corps.

Reference material of a historical nature such as records, articles of professional and scientific significance, letters, journals, speeches, and photographs relating to the activities of the Army Nurse Corps, are needed to highlight official references. It will be greatly appreciated if anyone posessing such material will forward it directly to: Director, Historical Unit, Forest Glen Section, WRAMC, Washington 12, D.C.

Any material forwarded will be returned after duplication if desired, or the material will be retained and filed in the Historical Unit.

The Medical Officer Writes

Articles Published in Other Journals

U.S. Army

SEROLOGIC DIAGNOSIS OF SCHISTOSOMA MANSONI INFECTIONS I. DEVELOPMENT OF A CERCARIAL ANTIGEN SLIDE FLOCCULATION TEST. Major Robert I. Anderson, MSC, USA, U.S. Army Tropical Research Medical Laboratory, San Juan, Puerto Rico. *American Journal of Tropical Medicine and Hygiene*, May 1960.

EFFECT OF D-GLUCURONIC ACID AND D-GLUCURONOLACTONE ON ASCORBIC ACID LEVELS IN BLOOD AND URINE OF MAN AND DOG. Captain Eugene M. Baker, MSC, USA, Edwin L. Bierman, M.D., and Major Irvin C. Plough, MC, USA, Fitzsimmons General Hospital, Denver, Colo. *American Journal of Clinical Nutrition*, May–June 1960.

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COMPARATIVE STUDY OF THREE ISOLATES WITH THE ORIGINAL FELINE VIRAL RHINOTRACHEITIS VIRUS. Major Robert A. Crandell, USAF, VC, Captain James R. Ganaway, USAF, VC, First Lieutenant Wendell H. Niemann, USAR, VC, and Colonel Fred D. Maurer, VC, USA, Armed Forces Institute of Pathology, Washington, D.C. *American Journal of Veterinary Research*, May 1960.

THE DANGER OF FOLIC ACID IN MULTIVITAMIN PREPARATIONS. Colonel William H. Crosby, MC, USA, Walter Reed Army Institute of Research, Washington, D.C. *Military Medicine*, April 1960.

DR. WILLIAM DAMESHEK: A BIOGRAPHICAL COMMENT. Lieutenant Colonel William H. Crosby, Jr., MC, USA, Walter Reed Army Medical Center, Washington, D.C. *Blood*, May 1960.

HEREDITARY SPHEROCYTOSIS: OBSERVATIONS ON HEMOLYTIC MECHANISMS AND IRON METABOLISM. Lieutenant Colonel William H. Crosby, Jr., MC, USA, and Captain Marcel E. Conrad, MC, USA, Walter Reed Army Medical Center, Washington, D.C. *Blood*, May 1960.

PAIN AS A MANIFESTATION OF ACUTE ANTERIOR-SPINAL-ARTERY THROMBOSIS. Captain John J. Dellar, MC, USA, Captain Raymond Scalettar, MC, USA, and Lieutenant Colonel Arthur J. Levens, MC, USA, Walter Reed General Hospital, Washington, D.C. *New England Journal of Medicine*, May 26, 1960.

THALLIUM POISONING, A REPORT OF SIX CASES. Captain Jack Domnitz, MC, USA, Brooke General Hospital, Fort Sam Houston, Texas. *Southern Medical Journal*, May 1960.

Titles of articles in current periodicals written by commissioned officers and civilian scientists in the medical services of the Department of Defense will be published each month insofar as space permits. This listing is gleaned from available periodicals and is not necessarily complete. Authors who wish to be included in this listing are invited to send a reprint of their published article to the *Journal*.—EDITOR.

U.S. Navy

THE EFFECT OF ENZYMATIC AGENTS, NITROGEN MUSTARD AND PHENERGAN ON AUTOLOGOUS AND HOMOLOGOUS SPLIT THICKNESS GRAFTS IN HUMANS. Lieutenant Karel B. Absolon, MC, USNR, and Captain Harry F. Lenhardt, MC, USN, U.S. Naval Hospital, Key West, Fla. *Plastic and Reconstructive Surgery and Transplantation Bulletin*, April 1960.

STUDIES ON PARALYTIC POLIOMYELITIS IN CAIRO, U.A.R., 1957–1958. Lieutenant Thomas G. Akers, MC, USN, Nemat Hashem, and M. Sabet Mahdy, U.S. Naval Medical Research Unit #3, Cairo, United Arab Republic. *American Journal of Tropical Medicine and Hygiene*, May 1960.

FURTHER STUDIES OF SMALL VESSEL ANASTOMOSIS AND REPLACEMENT IN THE DOG. I. PLASTIC PROSTHESES, II. AN UNIDENTIFIED HOST VARIABLE AFFECTING RESULTS. Captain Robert B. Brown, MC, USN, Lieutenant Commander Douglas R. Koth, MC, USN, Lieutenant Harold C. Urschel, Jr., MC, USNR, and Lieutenant Earl J. Roth, MC, USNR, Naval Medical Research Institute, Bethesda, Md. *Surgery*, June 1960.

FURTHER OBSERVATIONS ON INTESTINAL LESIONS ASSOCIATED WITH PHEOCHROMOCYTOMAS, A CASE OF MALIGNANT PHEOCHROMOCYTOMA IN PREGNANCY. Captain Robert B. Brown, MC, USN, and Lieutenant Melvin Borowsky, MC, USN, National Naval Medical Center, Bethesda, Md. *Annals of Surgery*, May 1960.

COXA PLANA IN MONOZYGOTIC MALE TWINS. Commander Adolphus W. Dunn, MC, USN, U.S. Naval Hospital, Guam, Mariana Islands. *Journal of Bone and Joint Surgery*, January 1960.

BLOW-OUT FRACTURE OF THE ORBIT. Commander Wayne L. Erdbrink, MC, USN, U.S. Naval Hospital, Oakland, Calif. *American Journal of Ophthalmology*, May 1960.

U.S. Air Force

RICE-FIELD LEPTOSPIROSIS IN TURKEY. A SEROLOGIC SURVEY. Major Walter E. Brewer, USAF, VC, Aaron D. Alexander, Fahri Hakioglu, and L. B. Evans, 4th Epidemiological Flight, USAF, Izmir, Turkey and Walter Reed Army Institute of Research, Washington, D.C. *American Journal of Tropical Medicine and Hygiene*, May 1960.

LITTLE LEAGUER'S ELBOW. Major Byron G. Brogdon, USAF, MC, and Major Neil E. Crow, USAF, MC, USAF Hospital, Lackland Air Force Base, Texas. *American Journal of Roentgenology, Radium Therapy and Nuclear Medicine*, April 1960.

SYSTEMIC LUPUS ERYTHEMATOSUS OF LONG DURATION. Captain Richard D. Carr, USAF, MC, and Lieutenant Colonel Robert Levine, USAF, MC, Lackland Air Force Base, Texas. *A.M.A. Archives of Dermatology*, March 1960.

THE U.S. AIR FORCE DENTAL CORPS. Lieutenant Colonel John A. Chapman, USAF, DC, Office of the Surgeon General, U.S.A.F., Washington, D.C. *The Journal of the American Dental Association*, March 1960.

DISORIENTATION IN HELICOPTER PILOTS. Major Herbert K. Eastwood, USAF, MC, and Major Charles A. Berry, USAF, MC, USAF School of Aviation Medicine, Brooks Air Force Base, Texas. *Aerospace Medicine*, March 1960.

Correspondence

Brooke Army Medical Center
Fort Sam Houston, Texas

Dear Sir:

I have read with great interest the report by Commander Leopold and Lieutenant Huber on the "Ineffectiveness of Suction in Removing Snake Venom from Open Wounds" in the issue of June 1960. Admittedly, the proper treatment of snake bite is a controversial topic, as can be surmised from the number of articles recently published on this subject, as well as the volume of correspondence following each such publication. However, the conclusions drawn by the above authors do not appear substantiated in their experiment, and warrant further explanation. More specifically, I do not feel that their results are applicable to the therapy of snake bite in humans. The following thoughts deserve comment:

1. The authors made a cruciate incision into the adductor magnus muscle of rabbits with a ¼-inch stylet. No mention is made of the depth of these incisions (presumably ¼ inch), a fact that is of paramount importance as it has been conclusively demonstrated by Eaves [1] that "the presence of venom deep to the fascia of the superficial compartment of the leg in the areas drained by the deep lymphatics places a formidable barrier to any successful therapy of snake bite."

2. The elapsed time between incision and instillation of the venom is not recorded. This is another extremely important factor, in that it is entirely possible that a lethal dose of venom was introduced intravascularly via severed capillaries, venules, or arterioles immediately upon applying the venom to the incision. This is especially likely if such application was performed soon after incision (i.e., before complete hemostasis was effected). Further support to this hypothesis is provided by the author's statement that "all the animals died," leading one to assume that too much venom was either administered and/or absorbed from the site to permit survival, despite any subsequent therapy. If true, this would also render any comparison between the two groups invalid.

3. A rattlesnake administers venom to its victims through a puncture wound, rather than depositing it into an open laceration as was done by the authors. This fact alone, in the overwhelming majority of bites, mitigates against comparison of this experiment with the efficacy of various methods of therapy in clinical cases. Also, the Jackson method of treatment provides that incision is made over the puncture wound, followed by *immediate* suction in order to remove the venom which is presumably localized to a relatively small area. Although the rattlesnake venom is known to contain a "spreading factor," incision and suction within a reasonable period of time are much more likely to be effective in removing venom in this circumstance than attempting to remove any venom "laid" three minutes previously in an extremely vascular area. Briefly, the Jackson method encompasses the sequence of envenomization followed by incision, rather than incision followed by envenomization (except, of course in treating the bite of the legendary "retroactive rattlesnake"—alleged to be so poisonous that the victim is dead three days before he is bitten!).

4. In this series all the animals died regardless of the method of therapy, and the authors suggest that "suction is not an effective method of removing

venom from an open wound." Would it not be more logical to assume that such a massive dose of venom was used that *no* method of therapy—suction, immobilization, or otherwise—would be successful? In any event, the quoted statement implies that suction is not effective in removing any appreciable amount of venom. This could only be proved by analyzing the material removed by suction for venom content, and finding none. In one of Jackson's experiments,[2] he injected a lethal dose of venom into a dog, incised the area, and applied suction. The material removed was then injected into normal dogs who soon died, while the dog injected with the venom survived.

5. It has been well demonstrated that immobilization of the bitten extremity is an important factor in therapy. Therefore, the manipulation required in applying suction to uncomprehending, excited, toxic animals certainly aids in venom spread, theoretically at least accounting for earlier deaths of the animals so treated. Therefore, the conclusion that "suction may be conducive to a more rapid invasion of venom" is certainly open to question. Rather it would seem that *any* manipulation following envenomization is conducive to more rapid invasion of venom, especially venom deposited into an open wound, rather than injected.

It is admitted that suction *may* not be able to remove significant quantities of venom from open wounds. However, analysis of the material removed for venom content and comparing this amount with the total dose administered (rather than comparison of death rates) should definitely prove or disprove this statement.

Until more conclusive studies are performed, the use of incision and suction (plus immobilization, supportive measures, adequate antivenin and possibly cryotherapy) is warranted in the treatment of snake bite.

JOHN P. DARBY, JR., CAPTAIN, USAF, MC

Naval Medical Field Research Laboratory
Camp Lejeune, North Carolina

Dear Sir:

Thank you for the opportunity to answer some of Captain Darby's questions. First, our experiment deals with venom placed in a muscle. The cruciate incisions were made with a stylet having a ¼-inch long blade and the cuts were made to that depth. It is unfortunate that the reference [1] a thesis, was unknown to the personnel of this laboratory.

Second, the placement of venom followed the incision immediately. The experiment was to determine whether suction would remove, hold, or stop the venom.

Third, a paper presented from this laboratory at the AMA Annual Convention at Miami, Fla., 16 June 1960, answers the questions concerning the assay of material removed by suction. Incidentally, bleeding exceeded 2–3 ml in only one rabbit (10 ml). A known amount of venom was placed in the wound; suction did not remove all of the venom since sufficient remained to kill the rabbits.

Fourth, no debate will be offered upon Jackson's experiments. There is a significant difference between the effect of venom injected intramuscularly and subcutaneously. In a report being prepared at this laboratory, proof of the intramuscular deposition of venom by live snakes is presented.

Fifth, the rabbits were immobilized by tying so that they could not move. The suggestion is made that the application of suction resulted in manipulative move-

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ment of the muscle and probably was responsible for earlier death. A suction pump from a snakebite kit was used and suction could not be applied without pressure on the skin and underlying muscle.

ROBERT S. LEOPOLD, COMMANDER, MSC, USN

References

1. Eaves, C. C.: Snakebite, a Historical, Clinical and Experimental Study with a Critical Evaluation of a New Method of Treatment, Thesis, Baylor University, 1958.
2. Jackson, D.: Personal communication.

CALENDAR OF COMING MEDICAL MEETINGS

1960

September

4TH NATIONAL CANCER CONFERENCE, 13–15 Sept., University of Minnesota, Minn.

INTER-SOCIETY CYTOLOGY COUNCIL MEETING, 23–25 Sept., Chicago, Ill.

17TH ANNUAL MEETING OF THE AMERICAN MEDICAL WRITERS' ASSOCIATION, 30 Sept.-1 Oct., Chicago, Ill.

October

29TH ANNUAL MEETING OF THE AMERICAN ACADEMY OF PEDIATRICS, 15–20 Oct., Chicago, Ill.

SYMPOSIUM ON THE MEDICAL AND BIOLOGICAL ASPECTS OF THE ENERGIES OF SPACE, 24–25 Oct., San Antonio, Texas.

AMERICAN COLLEGE OF GASTROENTEROLOGY COURSE IN POSTGRADUATE GASTROENTEROLOGY, 27–29 Oct., Philadelphia, Pa.

67TH ANNUAL CONVENTION OF THE ASSOCIATION OF MILITARY SURGEONS OF THE UNITED STATES, 31 Oct.-2 Nov., Washington, D.C.

Chairmen of committees are invited to submit notices of forthcoming medical meetings to be published each month insofar as space permits. This listing is compiled from notices received by the Journal and is not necessarily complete. Chairmen are reminded that material should be in this office at least 2 months prior to date of meeting.—EDITOR.

This Is Your A. M. A.

THE 109TH ANNUAL MEETING of the American Medical Association in Miami Beach, Florida, in June, brought policy actions by the House of Delegates on a wide variety of subjects. Health care for the aged, pharmaceutical issues, occupational health programs, relations with allied health groups and with the National Foundation were among the subjects considered. Of particular interest to military medicine were 2 commendations.

The Medical Department of the United States Navy was commended by the House of Delegates for the outstanding program presented at the eighth Annual National Medical Civil Defense Conference on 11 June 1960 in Miami Beach. The conference program emphasized (1) clinical aspects of radiation, (2) human responses to confined environments, and (3) casualty care in disasters. The Association expressed its gratitude for the splendid Navy presentation, which contributed materially to the Association's program of continuing medical education in disaster care. These conferences are sponsored annually by the A.M.A. Council on National Security on the Saturday preceding the opening of the Association's annual meeting.

The Navy's Deputy Surgeon General, Rear Admiral Edward C. Kenney, MC, USN, introduced the Navy program and Rear Admiral Calvin B. Galloway, MC, USN, was moderator. The speakers and their subjects were: Captain E. Richard King, MC, USN, "The Clinical Management of Patients Exposed to Radiation in Disaster"; Lt. Commander Lenore Simon, NC, USN, "Nursing Care of the Radiation Patient"; Captain George W. Hyatt, MC, USN, "Procurement, Processing, and Storage of Bone Marrow—Implications for Civil Defense"; Commander William McFarland, MC, USN, "Current Status of Bone Marrow Transplantation—Disaster Aspects"; Captain Harry S. Etter, MC, USN, "Medical Aspects of Shelter Survival"; Captain Gerald J. Duffner, MC, USN, "Life in Confined Environments"; Lt. Commander John E. Rasmussen, MSC, USN, "Group Behavior in Isolation—Antarctica"; Captain Clifford P. Phoebus, MC, USN, "Disaster—The Past is Prologue"; and Captain Malcolm W. Arnold, MC, USN, "Techniques of Teaching First Aid and Self Aid for Disasters."

The Department of Defense and the Department of the Air Force were commended for establishing and operating the Aeromedical Evacuation Service of the Military Air Transport Service. The House of Delegates urged that the Aeromedical Evacuation Service be maintained as a permanent feature at optimum efficiency. The Association is of the opinion that the Aeromedical Evacuation Service provides the most practical means for the delivery of military patients; is the most expeditious, most economical, and most medically acceptable; delivers the patients to specialized hospitals within minimum time limits; ensures that the patient receives specialized medical care; and costs less than transportation by other means.

With respect to health care for the aged, the following statement was adopted by the House of Delegates:

> Personal medical care is primarily the responsibility of the individual. When he is unable to provide this care for himself, the responsibility should properly pass to his family, the community, the county, the

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From the Council on National Security of the American Medical Association. The views and opinions expressed are not necessarily those of the Department of Defense.—EDITOR.

state, and only when all these fail, to the federal government, and then only in conjunction with the other levels of government, in the above order. The determination of medical need should be made by a physician and the determination of eligibility should be made at the local level with local administration and control. The principle of freedom of choice should be preserved. The use of tax funds under the above conditions to pay for such care, whether through the purchase of health insurance or by direct payment, provided local option is assured, is inherent in this concept and is not inconsistent with previous actions of the House of Delegates of the American Medical Association.

Concerning pharmaceutical issues, the House took action in regard to mail-order drug houses and the development and marketing of pharmaceutical products. The House agreed with representatives of the pharmacy profession that the unorthodox practice of mail-order filling of prescription drugs is not in the best interest of the patient, except where unavoidable because of geographic isolation of the patient. It was pointed out that in the mail order merchandising of prescription drugs the direct personal relationship, which exists between the patient-physician-pharmacist at the community level and which is essential to the public health and the welfare of patients, is lost.

The Board of Trustees was directed to request the Council on Drugs and other appropriate Association councils and committees "to study the pharmaceutical field in its relationship to medicine and the public, to correlate available material, and after consultation with the several branches of clinical medicine, clinical research, and medical education and other interested groups or agencies, submit an objective appraisal to the House of Delegates in June 1961." The statement pointed out that certain proposals have been made that, if carried out, might impair the future of pharmaceutical research and development, thus retarding the progress of scientific therapy. It also said that the services of the pharmaceutical industry are so vital to the public and to the medical profession that an objective study should be made.

In regard to occupational health programs, the House approved a revised statement on the "scope, objectives and functions of occupational health programs," which was originally adopted in June 1957. The new statement contains no fundamental alterations in Association policy or ethical relationships, but adds important new material on the following points: (1) greater emphasis on the preventive and health maintenance concepts of occupational health programs; (2) a more positive statement of organized medicine's obligation to provide leadership in improving occupational health services by part-time physicians in small industry; (3) increased emphasis on rehabilitation of the occupationally ill and injured; (4) inclusion of the proper use of immunization procedures for employees, as approved by the House in 1959; and (5) a more adequate statement on the need for teamwork with lay industrial hygienists in tailoring each occupational health program to the particular employee group involved. The House also accepted a suggestion that the A.M.A. Council on Occupational Health undertake a project to study and encourage the employment of the physically handicapped.

The House approved the final report of the Committee to Study the Relationships of Medicine with Allied Health Professions and Services, and commended it as "a monumental work." The report covers the present situation and future implications and recommendations, including guiding principles and approaches to activate physician leadership. The House strongly recommended that Asso-

ciation activity in this vitally important area be continued, and it approved the appointment of a Board of Trustees committee to carry on the work.

Two actions involving relations between the medical profession and the National Foundation were taken by the House. It adopted a statement of policies for the guidance of state medical associations and recommended that they be adopted by all component medical societies. These policies cover such subjects as membership of medical advisory committees at the chapter level, the function of these committees, and basic principles that should govern the relationships between patients concerned, members of the component medical society, and the National Foundation's local chapter. The House also directed the Board of Trustees to authorize further conferences with leaders in the National Foundation on the problem of poliomyelitis as it relates to the betterment of the public health and to consider further joint action toward the eradication of poliomyelitis. The House commended the National Foundation for its outstanding service in the attack against poliomyelitis, but pointed out that much work remains to be done in public education, vaccination, continuing assistance for victims of the disease, and continued research.

In other actions the House of Delegates: (1) strongly reaffirmed its support of the Blue Shield concept in voluntary health insurance and approved specific recommendations concerning A.M.A.–Blue Shield relationships; (2) approved a contingent appointment of not more than 6 months for foreign medical school graduates who have been accepted for the September 1960 qualification examination; (3) agreed that the Association should sponsor a second National Congress on prepaid health insurance; (4) approved a Board of Trustees request to the Postmaster General for a stamp commemorating the Mayo brothers; (5) decided that the establishment of a home for aged and retired physicians is not warranted at this time; (6) approved the establishment of a "Scientific Achievement Award" to be given to a nonphysician scientist on special occasions for outstanding work; (7) approved the following schedule for future annual meetings: Atlantic City 1963, San Francisco 1964, and New York City 1965 (the 1961 and 1962 annual meetings will be held in New York City and Chicago, respectively); (8) approved the objectives of the A.M.A. Commission on the Cost of Medical Care established by the Board of Trustees and headed by Louis M. Orr, M.D., immediate past president of the Association; (9) encouraged individual members of the Association to take a greater interest and more active part in public affairs on all levels; (10) reaffirmed its opposition to compulsory inclusion of physicians under title II of the Social Security Act and recommended immediate action by all Association members in accord with this position; (11) called for a review of existing and proposed legislation pertaining to food and color additives, with the objective of supporting appropriate measures that are scientifically sound and practical and in the public interest; (12) urged reform of the federal tax structure so as to return to the states and their political subdivisions their traditional revenue sources; (13) asked state and county medical societies to make greater use of A.M.A. recruitment materials in presenting medicine's story to the nation's high schools; (14) requested the Board of Trustees to initiate a study of present policy regarding the required content and method of preparing hospital records; (15) directed the Board of Trustees to develop group annuity and group disability insurance programs for Association members; (16) expressed grave concern over the indiscriminate use of contact lenses; and (17) reaffirmed its policy position that the examination of class III pilots should be done by especially qualified doctors of medicine.

Book Reviews

COMMAND DECISIONS, prepared by the Office of the Chief of Military History, Department of the Army. *Kent Roberts Greenfield*, general editor, with 16 contributors. Introduction by *Hanson W. Baldwin*. 481 pages; illustrated. Harcourt, Brace and Co., New York, N.Y., 1959. Price $5.95.

This highly interesting book contains 20 monographs on military decisions made in World War II. The monographs are the work of 16 authors who at present are in the Office of the Chief of Military History or have been associated with it in the past. Nearly all of them served in the military service during the War and one was an officer in the German air force. Each of the articles covers a definite decision made by a military commander or the head of a government acting as the commander-in-chief of the military establishment of his country. One deals with the decision to use the atomic bomb; another with the German decision to invade Norway and Denmark. The impartiality shown in these studies is indicated in this latter monograph, in which the author points out that the Allies had planned to occupy strategic cities along the Norwegian coast but that the German landings forestalled them. The various factors involved in the decision to evacuate Japanese citizens and aliens from the Pacific states after Pearl Harbor are well presented in another excellent article and show the effect of war hysteria and of pressure groups in forcing action that may be neither necessary nor in the public interest. There was no plan for dealing with such a contingency as arose. The lesson from this study is an important one in view of the heterogeneous character of our population and the problems that may arise in future emergencies. Some of the other subjects covered in the various chapters are the decisions to invade North Africa and to defeat Germany first as a basic concept of Allied strategy; the choice of the Persian Gulf as the route to aid the U.S.S.R.; the reasons for allowing the Russians to occupy Prague and East Germany; and the German counteroffensive in the Ardennes. Mr. Baldwin in his introduction quotes Voltaire's statement that history can be freely written only in a free country; certainly criticism of the courses taken by leaders charged with the responsibility of making the decisions are not withheld by the authors of the monographs. In one or two instances even motives are questioned. Although Voltaire's dictum may be open to question, there is none regarding the pull-no-punch approach in these studies, in which the political and military situation in each case is outlined, together with the decision that was made, and the results, good or bad, in the light of later and more complete information. This gives to the military or historically minded reader something of the interest that a chess problem has to a chess player or an equation to a mathematician. There is a bibliography for each section and a good index. Thumbnail biographies of the authors are an interesting feature. The book is handsomely bound and printed and the maps are excellent, including the endpaper maps of the world with the decision areas indicated on them.

CAPT. LOUIS H. RODDIS, MC, USN (RET.)

MEDICAL CARE OF THE ADOLESCENT, A Textbook Concerning the Medical Care and Understanding of Adolescents Themselves and of their Disorders, by *J. Roswell Gallagher*, M.D., and the staff physicians of the Adolescent Unit, The

Children's Hospital Medical Center, Boston, Mass. 369 pages; illustrated. Appleton-Century-Crofts, Inc., New York, N.Y., 1960. Price $10.

This is the long awaited textbook on the comprehensive medical care of the adolescent by Dr. Gallagher and the staff physicians of the Adolescent Unit of the Children's Medical Center, Boston. Twenty-eight of the staff contribute to the book in their specific fields. The opening chapters impart to the reader the Adolescent Unit's belief in the adolescent as a person and its philosophy of adolescent medical care together with implications for diagnosis and treatment. Also included are history taking and the medical examination. The succeeding chapters consider specific complaints including the gynecologic examination of adolescents, fatigue and fitness, athletic injuries, scholastic failure, emotional problems, and delinquency. The book should, allowing for possible personal basic differences of philosophy on the part of the individual reader, attain wide acceptance among physicians with a serious interest in the adolescent and his medical care. For the first time, the total medical care of the adolescent has been considered in one volume, which is at the same time a complete enough work for reference and most helpful to the busy clinician. Recent references are included with each chapter, together with a comprehensive list of references at the back of the book. It may be argued that some of the material presented is also covered in other available standard texts of medicine or pediatrics. However, Dr. Gallagher presents his material from the point of view of how it affects the adolescent and how the physician must be aware of the feelings of the patient. An example is the importance of fully explaining the gynecologic examination in the adolescent female and the reasons why a good rectal examination is to be preferred to a pelvic examination poorly performed. The present volume expresses completely the attitude of the Boston group and fulfils an existing need for a standard text in the field of adolescent medicine. It is to be hoped that the author plans frequent revisions in the future.

MAJ. FREDERICK C. BIEHUSEN, MC, USA

Oxygen Supply to the Human Fetus, A Symposium organized by the Council for International Organizations of Medical Sciences and the Josiah Macy, Jr., Foundation, edited by *James Walker* and *Alec C. Turnball*, assisted by *Clement A. Smith* and *Donald H. Baron*. 313 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $10.50.

The recording of this symposium is a collection of papers, discussions, data, and methods of study on the subject. It is a highly technical text and certainly not recommended for "light reading." It represents the combined efforts of clinicians and experimental workers in this field, from all over the world. An effort is made to assemble and correlate the work and data of all workers in the field. This is rather a new approach in obstetrics. Mostly, research in obstetrics has been directed toward the mechanics of obstetrics, rather than the physiologic phenomena that precede and follow delivery. The text presented is actually an edited proceedings of the symposium held in 1957. The papers were presented by outstanding authorities, followed by discussion. Frank, searching, critical discussions tested and weighed each worker's results and findings. The book is adequately illustrated with graphs, photographs, and tables to allow careful study and understanding. It is divided into 6 sections, each having papers devoted to different aspects of the subject, and each followed by appropriate and critical discussion. The volume opens with studies on physiology of oxygen transport and transfer. One section is devoted to anatomic study of uteroplacental and fetal circulation. The next section deals with uteroplacental blood flow and

oxygen consumption, measurements and studies of intervillous spaces. One very interesting paper in this section deals with fetal effects of uterine contractions during labor. A study is presented on cord blood oxygen levels, with methods of study and results. In this, the ingenuity of the workers' experiments is most instructive and interesting. A section is then devoted to technics of study. This, of course, is of great interest to one who is research minded. In the last section, which is of greatest interest to obstetricians in general, asphyxia and clinical fetal distress are discussed. The bibliography is lengthy and comprehensive. This valuable reference work, worthwhile in any medical library of a teaching institution, offers comprehensive coverage and correlation of worldwide work on a subject of vital interest in the field of obstetrics.

CAPT. ROY W. TANDY, SR., MC, USN

ELONGATION TREATMENT OF LOW BACK PAIN, by *George H. Hassard,* M.D., and *Charles L. Redd,* B.S., P.T., with forewords by *Harvey E. Billig, Jr.,* M.D., F.I.C.S., F.A.C.S.M., and *B. S. Minsker.* 78 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $4.50.

This booklet with its résumé of theory and procedure should prove invaluable to general practitioners, orthopedists, and physical therapists who are confronted with the problem of low back pains, the old enigma that has haunted medicine since man walked upright. This book is well organized, and a review of the table of contents quickly demonstrates the scope of the work. It begins properly with the basic mechanical considerations, anatomy, and a few physiologic facts. A simple plan of preventing the syndrome is outlined. The figures, line drawings, and photographs are outstanding features for both clarity and instructional value. The treatment regimen that is described and espoused is a controversial one: when applied by properly trained "believers" it is clinically effective; otherwise it is considered by many to be of doubtful value. The roles of prevention, physical fitness, and patient cooperation with treatment are stressed and are perhaps the strongest features of the book. COL. JOHN H. KUITERT, MC, USA

PRINCIPLES OF ORTHOPAEDIC SURGERY, by *Paul C. Colonna,* M.D. Revised edition. 799 pages; illustrated. Little, Brown & Co., Boston, Mass., 1960. Price $22.

This book is an attempt to cover the subject of general orthopedics and trauma in one small volume. There are 17 chapters printed on good paper with clear print and reasonably satisfactory organization. The first chapter briefly touches on the physiology of bones and joints, borrowing freely from more comprehensive material presented by other writers. This chapter includes several paragraphs on physical diagnosis, x-ray technic, and even surgical technic. The second chapter on pathology of bones and joints includes such subjects as bone grafting for non-union and the technic for intramedullary nailing of a femoral shaft along with postoperative care. The latter is presented in a 15-line capsule that is too brief for either the initiated or the beginner. Chapters 3 to 15 inclusive simply divide orthopedics into regions, with anatomy, physiology, treatment, and surgical technic dealt with in a rather haphazard and certainly incomplete fashion. Chapter 15 is a synopsis of neuromuscular disorders, chapter 16 presents tumors of bone in 58 pages, and the last chapter is a sketchy discussion of a few orthopedic appliances. Several chapters in this book are interesting. Those on the hip and on the shoulder are certainly of value. The author shows enthusiasm throughout for the use of fluoroscopy in the reduction of fractures.

There are many orthopedists who do not share this enthusiasm. The author also seems preoccupied with the subject of bone tuberculosis, a discussion of which is repeated in each chapter.. A complete discussion including a more up-to-date presentation of present chemotherapy would take less space and be more instructive. Other advice given by the author is not acceptable to many orthopedic surgeons. He advocates the Kocher method for reduction of a shoulder dislocation and discusses no other method. He suggests packing compound wounds with petroleum gauze. Strapping of the hand over a gauze roller bandage for metacarpal fractures is described. The subject of rachitic deformities of the legs is disposed of in 27 words. These are but a few of the errors of omission or commission in this text. This book is well illustrated, especially with those familiar illustrations borrowed from other books. The reproduction of photographs is excellent and the line drawings are unusually clear and expertly labeled. The references, although not numerous, are adequate. It has been said that it is impossible for one author to give comprehensive coverage to the subject of general orthopedics including fractures under one cover. The author has once again proved this to be true. This book is not recommended for students or general surgeons. It may be interesting reading for the orthopedist, who will be able to sift the wheat from the chaff. CAPT. CLIFFORD A. STEVENSON, MC, USN

Final Reminder!

MAIL the June Reader Poll Questionnaire—*Now!*

METABOLIC ASPECTS OF RENAL FUNCTION, by *William D. Lotspeich*, M.D. 214 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $7.50.

This is a well-written book of selected topics on the metabolic aspects of renal function. The transport and metabolism of phosphate, amino acids, glucose, and phlorizin are thoroughly discussed. The synthesis and secretion of ammonia is comprehensively examined. This book is very well indexed and has many references. This short volume should be of great value not only to physiologists but to all those physicians who are interested in renal metabolism.

MAJ. ANTHONY A. BORSKI, MC, USA

PRINCIPLES AND TECHNIQUES OF PSYCHIATRIC NURSING, by *Madelene Elliott Ingram*, R.N. 5th edition. 479 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1960. Price $5.50.

This completely revised edition of a well-known text is directed primarily to the beginner in psychiatric nursing. It is divided into 5 units with a summary outline, questions, and suggested reference list at the end of each chapter. There is a glossary of terms after the last chapter. Unit I gives a brief history of the treatment of mental illness, pointing out the effect of traditional attitudes on present-day practices. Unit II is concerned with protective and supportive care of the patient with emphasis on communications in various nursing situations.

In Unit III the author discusses psychiatric theory and treatment and the latest classifications of mental disorders, presents suggestions on observation and recording, and discusses various specific psychiatric treatments used today. Unit IV deals with the use of the arts and physical activities in psychiatric nursing and discusses various nursing skills and technics that are not centered around clinical care. The last unit demonstrates how psychiatric nursing skills can be utilized in specialized situations such as after-care centers, part-time psychiatric centers, preventive measures, and mental health. Miss Ingram emphasizes interpersonal relationships and communication skills throughout the book, suggesting specific technics in specific situations. Although it may seem to some practitioners in psychiatric nursing that too much time is spent on technics, I agree with the author's purpose in this approach—that the beginner must rapidly learn some "how to's" to provide immediate patient care, and that theories of relationships will be learned more readily with some grounding in technics of relationships and with practice. The book is written clearly, in language that will be readily understood by the student nurse for whom it is written, and should be very helpful to her as she begins her experience in pyschiatric nursing.

MAJ. CHARLOTTE R. RODEMAN, ANC

THE SZONDI TEST, In Diagnosis, Prognosis and Treatment, by *Lipot Szondi*, M.D., *Ulrich Moser*, Ph.D., and *Marvin W. Webb*, A.M., Ed.D. 309 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., 1959. Price $12.

This manual deals with a projective test in which a person chooses 2 pictures he likes and 2 pictures he dislikes from each of 6 sets of 8 photographs (48 cards). To obtain maximum utilization of this technic it is recommended that the test be readministered at various intervals in order to obtain a stable evaluation of coercive choice within some kind of temporal continuum. The authors, who are protagonists of the Szondi method, identify it as "not merely another psychologic projective test, but, rather, a truly biologic test instrument." The clinician should be an adherent of the schicksal psychology (depth psychologic system) because "it is impossible to employ the Szondi test with any degree of accuracy outside the frame of reference in which it was developed." The authors differentiate 3 languages of the unconscious that underlie the analysis of personality. They stress their use of the language of choice, which emphasizes the study of the familial unconscious in schicksal analysis. The choice of photographs is not a product of chance and its significance is inherent in genotropism, a synthesis of heredobiologic psychiatry and freudian psychoanalysis. Szondi's theoretic formulation is somewhere intermediate between the personal unconscious of freudian psychoanalysis, which stresses symptomatic language, and the collective unconscious of jungian complex analysis with its symbolic language. It is through this selection of szondian photographs that a person projects his thoughts, feelings, and aspirations. Ever since the introduction of this test on the American scene some 15 years ago, about 400 articles have been written on this subject, less than 1 percent of which are contained in this volume. It would appear that with the omission of these studies of negative empiric evidence the present manual is overwhelmingly biased in favor of its own technic. For the most part, the evidence in the manual consists of illustrative case studies revolving about the Szondi test. Any practical clinician will heartily agree with the authors that "there never will be any substitute for the skill and judgment of the individual clinician." However, our present state of knowledge about projective tests identifies the most likely valid procedure for analyzing projective data—in

terms of other data that reflect the dynamic levels and trends of personality organization rather than in terms of the questionable biopsychologic genotropism of Szondi. It should not be overlooked that the test is used without its avowed theoretic frame of reference in America today. The technic is an ingenious idea but it is wholly unvalidated and still in an empiric stage of development. The authors would have you believe that an adequate evaluation of the Szondi test is one that purports to support the assertions made by the test. It is this prejudice in their approach that deters more American psychologists, among others, from taking to the Szondi method. This manual does clarify the rationale of the Szondi test and should help its users obtain competence in its clinical interpretation. It spells out in detail the variable gamuts underlying its technic in diagnosis, prognosis, and treatment. No other English text provides as much material to enable a user to acquire the necessary basic knowledge of szondian depth psychology.

LT. COL. FRANK KILLIAN, JR., USAF, MSC

WHILLIS'S ELEMENTARY ANATOMY AND PHYSIOLOGY, by *Roger Warwick*, B.Sc., Ph.D., M.D. 4th edition. 274 pages; illustrated. Little, Brown and Co., Boston, Mass., 1960. Price $6.

This textbook on human anatomy and physiology is clearly written for students who need only basic facts. It would be appropriate for use by medical technicians, nurses, physiotherapists, and chiropodists. Although structure is the featured aspect, function is brought in at appropriate intervals. For the beginning student, this admixture of structure and function should be very instructive. Osteology is the lead-off subject, and it is followed by a discussion of muscles, these being considered from both the anatomic and functional approaches. This latter chapter incorporates kinesiology. The digestive system and digestive activities, including absorption, are presented briefly, but the coverage is good. Hematology, the heart (and its physiology, in brief), circulation (hemodynamics), and the principal blood vessels comprise several chapters. The respiratory system including pulmonary physiology is covered briefly, as is metabolism. The urinary system is covered in one brief chapter. The chapter on the nervous system is fairly extensive and includes fundamental histology, pathways through the spinal cord, fundamentals of the anatomy and function of the autonomic system, and the sense organs. The genital system is given brief treatment, as is the skin, the endocrine glands, the spleen, and the liver. An appendix on nomenclature is included, and care has been taken to supplenent BNA terms as they appear in the text with INA terms.

HENRY B. HALE, PH.D.

ANOREXIA NERVOSA, Its History, Psychology, and Biology, by *Eugene L. Bliss*, M.D., and *C. H. Hardin Branch*, M.D. 210 pages; illustrated. Paul B. Hoeber, Inc., Medical Division of Harper & Bros., New York, N.Y., 1960. Price $5.50.

In this monograph the authors explore the history of anorexia nervosa, its clinical aspects, biology, psychodynamics, and treatment. At the end of the dissertation the authors record 22 additional protocols of their own patients. After struggling with the problem of definition, the authors conclude that perhaps anorexia nervosa might be best defined as a disorder characterized by excessive loss of weight due to psychologic causes. They feel, and admirably demonstrate in their monograph, that it may be a symptom found at times in almost all psychiatric diagnostic categories and in both sexes, though most frequently in females. The authors discuss the symbolic significance of food, obesity, and various fantasies that the patients may hold. They differentiate between

anorexia and Simmonds' disease, showing that an excessive loss of weight is not a typical disturbance found in Simmonds' disease, and that endocrine deficiencies are not a part of the syndrome of anorexia nervosa. The authors also note that vitamin deficiencies are virtually nonexistent in these patients. This monograph is a comprehensive and painstaking study of the disorders commonly called anorexia nervosa. It is highly recommended to anyone interested in this condition.

LT. COL. JAY F. TUTTLE, MC, USA

OUTLINE OF ORTHOPAEDICS, by *John Crawford Adams*, M.D. (London), F.R.C.S. (England). 3d edition. 440 pages; illustrated. Williams & Wilkins Co., Baltimore, Md., 1960. Price $8.00.

In this edition, the author has thoroughly revised the text in line with current concepts of orthopedics. He has successfully covered the field of orthopedics in a concise, easy to read book. He has managed to give adequate descriptions of conditions while maintaining brevity of discussion throughout. Operative technics have been kept to a minimum and consideration of fractures omitted. The first chapter is well conceived and is devoted to the clinical methods employed to make a diagnosis and to general methods of treatment. In the second chapter, the author discusses the general aspects of orthopedic conditions. The remaining 8 chapters are devoted to orthopedic conditions as applied to each region of the body. Methods of examination and classification of the disorders for each region are very valuable portions of each chapter. The text is adequately complemented with diagrams and illustrations. The author has succeeded in his goal of presenting current knowledge of orthopedics in a brief, easily read text written primarily for the student, the general practitioner, the physiotherapist, and the orthopedic nurse, to whom I recommend its use.

COL. JOSEPH W. BATCH, MC, USA

PRIMARY TUMORS OF THE CALVARIA, with Special Consideration of the Clinical Problems, by *Franklin Jelsma*, M.D. 116 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $7.

This monograph is based upon the author's experience with more than 49 cases of benign and malignant tumors originating in the membranous bones of the skull. As he points out, such tumors are not too common and are usually the subject of individual case reports. For clinical purposes he has arranged a classification table of these tumors that is simple and usable. The illustrations are, in general, adequate for the demonstrations of the radiographic appearance of these lesions. A more detailed discussion and delineation of the various radiographic findings would be desirable, as this aspect of the evaluation of patients with problems of this type is paramount in reaching a conclusion regarding the most probable diagnosis. Since this is primarily a clinical presentation, there are many case reports. These are concise and informative. There is probably too much understatement and modesty regarding some of the operative procedures. The technical aspects of management of many of these lesions are of interest and could have been illustrated to advantage. Bibliographic references are pertinent but not pedantic. After reading this book I felt as one might who had sat in the library of a surgeon of maturity and listened to him relate his experiences in an informal and informative way. There is no pontification, merely a quiet description of what he has seen and how his experience relates with that of others. To someone who enjoys an anecdotal presentation, I can recommend this book.

LT. COL. GEORGE J. HAYES, MC, USA

New Books

Books received by the U.S. ARMED FORCES MEDICAL JOURNAL *are listed in this department for the information of readers, and as acknowledgment and appreciation of their receipt from the publishers. Those of greatest interest will be selected for review in a subsequent number of the* JOURNAL.

PHYSICS AND MEDICINE OF THE ATMOSPHERE AND SPACE, edited by *Otis O. Benson, Jr.*, and *Hubertus Strughold*. The proceedings of the Second International Symposium on the Physics and Medicine of the Atmosphere and Space, held at San Antonio, Texas, November 10, 11, 12, 1958, sponsored by The School of Aviation Medicine, Aerospace Medical Center (ATC), Brooks Air Force Base, Texas. Arranged by Southwest Research Institute, San Antonio, Texas. 645 pages; illustrated. John Wiley & Sons, Inc., New York, N.Y., 1960. Price $12.50.

ADMINISTRATION OF PUBLIC HEALTH SERVICES, by *Ruth B. Freeman*, R.N., Ed.D., and *Edward M. Holmes, Jr.*, M.D., M.P.H. 507 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1960. Price $6.75.

SURGERY AND CLINICAL PATHOLOGY IN THE TROPICS, by *Charles Bowesman*, O.B.E., B.A., M.D., F.R.C.S.E., F.A.C.S., D.T.M., H.Ed. 1,068 pages; illustrated. Williams & Wilkins Co., Baltimore, Md., 1960. Price $22.50.

AMERICAN DRUG INDEX, 1960, by *Charles O. Wilson*, Ph. D., and *Tony Everett Jones*, Ph. D. 712 pages. J. B. Lippincott Co., Philadelphia, Pa., 1960. Price $5.75.

A BIBLIOGRAPHY OF INTERNAL MEDICINE, Selected Diseases, by *Arthur L. Bloomfield*, M.D. 312 pages. University of Chicago Press, Chicago, Ill., 1960. Price $6.

STRESS AND CELLULAR FUNCTION, by *H. Laborit*, M.D., in collaboration with *M. Cara*, M.D., *D. Jouasset*, M.D., *C. Duchesne*, M.D., and *G. Laborit*, M.D. 255 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., 1959. Price $7.50.

ROENTGENOLOGIC DIAGNOSIS IN OPHTHALMOLOGY, by *Edward Hartmann*, M.D., and *Evelyn Gilles*, M.D., translated by *George Z. Carter*, M.D., and edited by *Conrad Berens*, M.D., F.A.C.S. 375 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., 1959. Price $15.

MANUAL OF SKIN DISEASES, by *Gordon C. Sauer*, M.D. 269 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., 1960. Price $9.75.

PEDIATRIC DERMATOLOGY, by *Henry H. Perlman*, M.D., Phar.D. 477 pages; illustrated. Year Book Publishers, Inc., Chicago, Ill., 1960. Price $18.

THE YEAR BOOK OF THE EAR, NOSE & THROAT (1959-1960 Series), edited by *John R. Lindsay*, M.D., with a section on Maxillofacial Surgery edited by *Dean M. Lierle*, M.D., and *William C. Huffman*, M.D., 360 pages; illustrated. Year Book Publishers, Inc., Chicago, Ill., 1960. Price $8.

THE OLDER PATIENT, by 21 authors, edited by *Wingate M. Johnson*, M.D. 589 pages; illustrated. Paul B. Hoeber, Inc., Medical Division of Harper & Brothers, New York, N.Y., 1960. Price $14.50.

AN ATLAS OF NEUROSURGICAL TECHNIQUES, by *James L. Poppen*, M.D. 522 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1960. Price $28.

PRINCIPLES AND METHODS OF CLINICAL CHEMISTRY FOR MEDICAL TECHNOLOGISTS, by *Eugene W. Rice*, Ph.D. 286 pages. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $7.

CARDIAC RESUSCITATION, edited by *J. Willis Hurst*, M.D. 141 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $5.50.

LIBIDO, by *J. E. Schmidt*, Ph.B.S., M.D., Litt.D. 278 pages. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $8.

ATLAS OF ANATOMY AND SURGICAL APPROACHES IN ORTHOPAEDIC SURGERY—UPPER EXTREMITY, by *Rodolfo Cosentino*, M.D., with a preface by *Arthur Steindler*. 192 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $10.50.

PRINCIPLES AND TECHNIQUES OF PSYCHIATRIC NURSING, by *Madelene Elliott Ingram*, R.N. 5th edition. 479 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1960. Price $5.50.

PRIMARY TUMORS OF THE CALVARIA, with Special Consideration of the Clinical Problems, by *Franklin Jelsma*, M.D. 116 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $7.

CHRISTOPHER'S TEXTBOOK OF SURGERY, edited by *Loyal Davis*, M.D. 7th edition. 1,551 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1960. Price $17.

WHILLIS'S ELEMENTARY ANATOMY AND PHYSIOLOGY, by *Roger Warwick*, B.Sc., Ph.D., M.D. 4th edition. 274 pages; illustrated. Little, Brown & Co., Boston, Mass., 1960. Price $6.

CURRENT THERAPY—1960, Latest Approved Methods of Treatment for the Practicing Physician, edited by *Howard F. Conn*, M.D., and 12 consulting editors. 808 pages. W. B. Saunders Co., Philadelphia, Pa., 1960. Price $12.

WOLFF'S DISEASES OF THE EYE, revised by *Redmond J. H. Smith*, D.O. (Eng.), M.S. (Lond.), F.R.C.S. (Eng.). 5th edition. 226 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $9.50.

LABORATORY IDENTIFICATION OF PATHOGENIC FUNGI SIMPLIFIED, by *Elizabeth L. Hazen*, Ph. D., and *Frank Curtis Reed*. 2d edition. 150 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $7.50.

NEW METHODS OF STUDYING GASEOUS EXCHANGE AND PULMONARY FUNCTION, by *Alfred Fleisch*, M.D. Authorized translation by *Charles Corsi*, with a preface by *L. Michaud*. 116 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $5.75.

OXYGEN SUPPLY TO THE HUMAN FETUS, A Symposium organized by the Council for International Organizations of Medical Sciences and the Josiah Macy, Jr., Foundation, edited by *James Walker* and *Alec C. Turnball*, assisted by *Clement A. Smith* and *Donald H. Baron*. 313 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1959. Price $10.50.

DIAGNOSIS AND TREATMENT OF DISEASES OF THE TRACHEA AND BRONCHI, by *Herman J. Moersch*, M.D., and *Howard A. Andersen*, M.D. 108 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $4.25.

MICROBIOLOGY AND PATHOLOGY FOR NURSES, by *Martin Frobisher, Jr.*, S.B., Sc. D., *Lucille Sommermeyer*, R.N., B.S., Ed.M., and *Raymond H. Goodale*, B.S., M.D. 5th edition. 888 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1960. Price $7.50.

MASSAGE, MANIPULATION AND TRACTION, edited by *Sidney Licht*, M.D. 275 pages; illustrated. Elizabeth Licht, Publisher, New Haven, Conn., 1960. Price $10.

NUTRITION IN CLINICAL DENTISTRY, by *Abraham E. Nizel*, D.M.D., M.S.D. 467 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1960. Price $10.

PHOTOGRAPHY IN MEDICINE, by *Arthur Smialowski* and *Donald J. Currie*, M.D., M. Sc., F.R.C.S.E., F.R.C.S. (C.), D.S., F.A.C.S. 330 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $14.50.

PRACTICAL NEUROLOGICAL DIAGNOSIS, With a Special Reference to the Problems of Neurosurgery, by *R. Glen Spurling*, M.D. 6th edition. 284 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960.

CURRENT APPROACHES TO PSYCHOANALYSIS, edited by *Paul H. Hoch*, M.D., and *Joseph Zubin*, Ph. D. 207 pages. Grune & Stratton, Inc., New York, N.Y., 1960. Price $6.50.

RADIOLOGIC RECORDS, by *Sister Christina Spirko*, C.S.J., R.T., B.S. in R.T., M.A., F.A.S.X.T., with a foreword by *Joseph Selman*, M.D., and an introduction by *Melvin Aspray*, M.D. 304 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $8.50.

DIAGNOSIS OF VETERINARY PARASITISMS, by *J. H. Whitlock*, D.V.M., M.S. 236 pages; illustrated. Lea & Febiger, Philadelphia, Pa., 1960. Price $10.

STUDIES ON VERTEBRATE NEUROGENESIS, by Professor *Santiago Ramon Y Cajal*, translated by *Lloyd Guth*, M.D. 432 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $13.50.

X-RAY TECHNOLOGY, by *Charles A. Jacobi*, B.Sc., R.T. (A.R.X.T.), M.T. (A.S.C.P.), and *Donald E. Hagen*, R.T. (A.R.X.T.). 2d edition. 453 pages; illustrated. C. V. Mosby Co., St. Louis, Mo., 1960. Price $10.

EXPLORATIONS IN THE PHYSIOLOGY OF EMOTIONS, edited by *Louis Jolyon West*, M.D., and *Milton Greenblatt*, M.D., with the assistance of an editorial board. 271 pages; illustrated. American Psychiatric Association, Washington, D.C., 1960. Price $2.

ENZYMES IN HEALTH AND DISEASE, edited by *David M. Greenberg*, Ph. D., and *Harold A. Harper*, Ph. D. 459 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $14.50.

A TEXTBOOK OF GYNECOLOGY, by *Laman A. Gray*, M.D., F.A.C.S., F.A.C.O.G. 470 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $15.50.

TENSIONS CAN BE REDUCED TO NUISANCES, A Technique for Not-Too-Neurotic People, by *Edmund Bergler*, M.D. 239 pages. Liveright Publishing Corp., New York, N.Y., 1960. Price $4.95.

PRINCIPLES OF ORTHOPAEDIC SURGERY, by *Paul C. Colonna*, M.D. Revised edition. 799 pages; illustrated. Little, Brown & Co., Boston, Mass., 1960. Price $22.

THE PROFESSIONAL SOLDIER, A Social and Political Portrait, by *Morris Janowitz*. 464 pages. The Free Press of Glencoe, Ill., 1960. Price $6.75.

CLINICAL MEDICINE AND THE PSYCHOTIC PATIENT, by *Otto F. Ehrentheil*, M.D., and *Walter E. Marchand*, M.D., with the collaboration of other members of the staff of the Veterans Administration Hospital, Bedford, Mass. Foreword by *Joseph M. Hayman, Jr.*, A.B., M.D. 383 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $10.75.

PSYCHOLOGY AND THE NURSE, by *Frank J. O'Hare*, C.S.C., Ph.D., 5th edition. 329 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1960. Price $3.75.

PRACTICAL PROCTOLOGY, by *Louis A. Buie, Sr.*, M.D., F.A.C.S. 2d edition. 737 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $22.50.

DOCTOR IN BOLIVIA, by *H. Eric Mautner*, M.D. 331 pages. Chilton Co., Philadelphia, Pa., 1960. $5.95.

A GUIDE TO THE STUDY OF DEVELOPMENT, by *William W. Newby*, Ph.D. 217 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1960. Price $4.

ELECTROPHORESIS IN PHYSIOLOGY, by *Lena A. Lewis*, Ph.D., LL.D., with a special chapter on Immunoelectrophoresis by *M. D. Poulik*. 2d edition. 120 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $5.50.

COSMETIC SURGERY, Principle and Practice, by *Samuel Fomon*, M.D. 651 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., 1960. Price $27.50.

THE NURSERY SCHOOL, A Human Relationships Laboratory, by *Katherine H. Read*. 3d edition. 333 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., 1960. Price $4.25.

TYPICAL GYNECOLOGIC OPERATIONS, With Special Consideration of Technical Advantages, by Dr. *Siegfried Tapfer*. Translated by *L. M. Szamek*, M.D. 81 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., 1960. Price $9.

CIBA FOUNDATION SYMPOSIUM JOINTLY WITH THE INTERNATIONAL UNION OF BIOLOGICAL SCIENCES ON BIOCHEMISTRY OF HUMAN GENETICS, edited by *G. E. W. Wolstenholme*, O.B.E., M.A., M.B., M.R.C.P., and *Cecilia M. O'Connor*, B.Sc. 347 pages; illustrated. Little, Brown & Co., Boston, Mass., 1959. Price $9.50.

WORLD REVIEW OF NUTRITION AND DIETETICS, edited by *Goeffrey H. Bourne*. 272 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., 1959. Price $12.

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THE YEAR BOOK OF UROLOGY, 1959–1960 Series, edited by *William Wallace Scott*, M.D., Ph.D. 374 pages; illustrated. Year Book Publishers, Inc., Chicago, Ill., 1960. Price $8.

CIBA FOUNDATION COLLOQUIA ON AGEING, Vol. 5, The Lifespan of Animals, edited by *G. E. W. Wolstenholme*, O.B.E., M.A., M.B., M.R.C.P., and *Maeve O'Connor*, B.A. 370 pages; illustrated. Little, Brown & Co., Boston, Mass., 1959. Price $9.50.

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CARDIAC AUSCULTATION, Including Audio-Visual Principles, by *J. Scott Butterworth*, M.D., *Maurice R. Chassin*, M.D., *Robert McGrath*, M.D., and *Edmund H. Reppert*, M.D. 102 pages; illustrated. Grune & Stratton, New York, N.Y., 1960. Price $6.25.

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DENTAL CLINICS OF NORTH AMERICA, Symposium on Practical Peridontal Therapy, March 1960. *Irving Glickman*, D.M.D., consulting editor. 226 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., March 1960. Price $4.

THE METABOLISM OF CARDIAC GLYCOSIDES, A Review of the Absorption, Metabolism and Excretion of Clinically Important Cardiac Glycosides, by *S. E. Wright*, Ph. D., M. Sc., A.R.I.C. 86 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1960. Price $4.75.

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